Lucent Technologies
Bell Labs Innovations

AnyMedia® Access System

Releases up to R1.6 and R1.13D

ONU Installation Manual for Indoor Applications

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About this document

1 Overview

Purpose

This Installation Manual (IM) provides installation instructions for Lucent Technologies' *AnyMedia*® Optical Network Unit (ONU), Releases up to R1.6 and R1.13D. The system will be delivered in only one configuration:

- Wall-mounted ONU for indoor applications

Scope

The ONU IM for Indoor Applications is intended to enable installation personnel to install the *AnyMedia* optical network unit. As only one configuration will be delivered with all passive system components and with all internal cabling *pre-installed*, the installer has mainly to perform the connections from and to the ONU. The IM ends before turning up the system.

The document can also be used as a trouble-clearing guide for installation wiring problems.

Intended audience

This installation manual is for customers who maintain their own installation organization to install the *AnyMedia* optical network unit and for technical support personnel.

Issue

This is Issue 3, of the *AnyMedia* optical network unit, Releases up to R1.6 and R1.13D, *Installation Manual*.

Reason for reissue

The *Installation Manual* has been reissued to include the following new features:

- Additional application pack (AP) to support single pair high bit rate digital subscriber line (SHDSL) and unstructured E1 ports.

The *Installation Manual* has been reissued to include the following corrections:

- Orderable documentation table corrected.

Document organization

The document has the following organization:

- *How are we doing*
  A comment form so readers can give feedback to improve the next revision of the document.
- *Table of contents, list of figures, list of tables*

- *About this document*

  Defines the purpose of the document and the intended audience. Also included are topics about the conventions used in the document, related documentation, how to order documents, and how to comment on this document.

- Chapter 1, *General safety information*

  Defines the types of safety labels and precautions associated with the *AnyMedia* Access System. Also included are general circuit pack handling precautions and specific warnings relating to lightwave safety, ESD considerations, handling batteries and other built-in equipment.

- Chapter 2, *General ONU information*

  Describes the *AnyMedia* optical network unit configuration for use in indoor applications and describes the parts of the ONU housing variant.

- Chapter 3, *Parts lists and kits*

  This chapter lists the assemblies, kits, parts, and tools required for the initial installation and describes the ordering information for all equipment and components of the *AnyMedia* optical network unit.

- Chapter 4, *Parts description*

  This chapter describes for the *AnyMedia* optical network unit all connectors and all parts to which cables or wires are connected including the internal cabling (factory preassembled).

- Chapter 5, *Mounting and installation procedures*

  This chapter includes instructions for field assembly of the ONU housing to the wall, including precautions and details for handling, inspection, placement, mounting and grounding the housing.

- Chapter 6, *Cabling, wiring and assembly*

  This chapter contains information for installing cable assemblies for application packs (AP) and for AC mains. Also included are general descriptions of cable and connector types.

- Chapter 7, *Mounting and installation of batteries*

  This chapter contains information for uncrating and inspecting batteries and how to mount them in the ONU housing.

- Chapter 8, *System power-up*

  This chapter describes the procedures for the first power-up of the ONU and the initial charging of the already installed batteries.

- Chapter 9, *Fiber test and installation*

  This chapter describes the principle of the fiber cabling and how to test the fibers with external test equipment.

- Chapter 10, *Equipping the ONU Subshelf*

  This chapter contains the procedures to equip the ONU with the optical controller pack and with application packs.

- Chapter 11, *Maintenance of the fan unit and of batteries*

  This chapter describes the different maintenance actions for the fan unit with the filter and for the batteries.

- *Abbreviations and acronyms*

  Lists the abbreviations and acronyms used to replace the longer expressions the abbreviations/acronyms represent.

- *Glossary*

  Defines terms that may be unfamiliar to the user.

- *Index*

  Lists in alphabetical order the specific subject information in the document.

2 Conventions used in this document

Terms used

The following are terms used in this IM that may have a different meaning than general or common use of the term.

- The term *AnyMedia* Access System is used here for the *AnyMedia* Mainshelf and also equally for the ONU Subshelf.
- The term *system configuration* is used here for the *AnyMedia* Access System when the text refers to a system equipped with certain packs or units for a certain application including the related database.
- *Mixed configuration* means a configuration of the *AnyMedia* Access System including packs for narrowband services and for broadband services.
- The term *AnyMedia* Mainshelf is used when the text refers to the shelf which houses the COMDAC, CIU, OAP and AFM pack.
- The term ONU Subshelf is used when the text refers to the shelf in the ONU (housing the OCP) which provides the interface for the optical link to the *AnyMedia* Mainshelf.
- The term *AnyMedia* shelves is used whenever the text does not need to distinguish between both types of shelves.
- Narrowband services typically include POTS services, permanent leased line (PLL) and integrated services digital network (ISDN) as well as n-times 64 kbit/s to 2 Mbit/s. In the current release of the *AnyMedia* Access System narrowband services comprise POTS, ISDN BRA services, analog leased lines (ALL), digital leased lines (DLL) and high bit-rate digital subscriber lines (HDSL).
- Broadband services are supported in the *AnyMedia* Access System using ATM cell transfer. In the current release of the *AnyMedia* Access System broadband services comprise Internet and remote LAN access via asymmetrical digital subscriber line (ADSL).

- *Mixed configuration* means a configuration of the *AnyMedia* shelves including packs for narrowband services and for broadband services.
- The term pack is generally used for circuit packs in the *AnyMedia* Mainshelf (COMDAC, CIU, IO_E1, IO_HDLC, PFU and AFM_E3/DS3) or in the ONU Subshelf (OCP, RGU, PRU, PFU and LVD) and also for all application packs.
- The term application pack is generally used for the packs in the *AnyMedia* Mainshelf and also in the ONU Subshelf which are located in any of the AP slots of the *AnyMedia* Access System (APs for POTS, ISDN, HDSL and ADSL).
- In this manual the subscriber interface for analog POTS is named *Z interface*. In some countries this interface can be called a/b interface where the a-leg sometimes may be called tip (T) and the b-leg ring (R).
- a/b-cables refer generically to the tip/ring pair cables that attach to the faceplate of all application packs (APs). In some countries this cable can be called V/F cable (voice frequency cable) or T/R cable.
- E1 interface refers to the 2048-kbit/s digital feeder interfaces of the narrowband system on the network side in the *AnyMedia* Mainshelf only.
- E3 interface refers to the 34.368-Mbit/s digital feeder interfaces of the broadband system that carries the ATM payload cells. The E3 interface is provided by the ATM feeder multiplexer AFM_E3.
- DS3 interface refers to a bit rate of 44.736 Mbit/s and a framing according to ITU-T recommendations G.804, I.432 and ANSI T1.107 without specifying the physical interface.
- The term DSX-3 interface refers in the *AnyMedia* Mainshelf only to everything that DS3 refers to with the addition of a specific physical interface according to Bellcore standard GR-499. The ATM feeder multiplexer AFMDS3 provides a DSX-3 interface. In this manual the more general term DS3 interface is used.
- The ATM feeder multiplexer AFM_E3 in the *AnyMedia* Mainshelf provides an E3 ATM user network interface. If a DS3 interface is required the ATM feeder multiplexer AFMDS3 has to be used instead.
- AFM pack is used in text sections where only the function of the ATM feeder is described, independent of the interface (E3/DS3).
- *Inband* signaling via *ATM Operation Channel* within ATM permanent virtual connection (PVC) means sending messages not via a special OAM&P interface but embedded in the ATM cell stream.
- ADSL line refers to the twisted copper pair carrying broadband and narrowband services. When depicting the broadband signal only, the term data is used.
- xDSL service means any broadband service transmitted over twisted pairs. Examples are ADSL, universal asymmetric digital subscriber line (UDSL), and very high bit rate digital subscriber line (VDSL).
- ADSL modem means the ADSL data circuit-terminating equipment at the customer's site.

- Splitter means the equipment at the customer's site to separate the narrowband signal from the data signal of the ADSL line. Although equipment exists which comprises the splitter and modem in one unit, in this manual the splitter is depicted separately from the ADSL modem.
- The term customer premises equipment (CPE) in general covers the subscriber's installation and subscriber's terminal.
  For ADSL lines the CPE consists among other equipment of an ADSL modem and a splitter (to separate the narrowband signal from the data signal). If both units are meant as a whole the term customer premises equipment (CPE) is used in this manual.
- HDSL link refers to two HDSL copper pairs transferring 2×1168 kbit/s each.
- The *AnyMedia* graphical system interface software (GSI) provides one graphical user interface for narrowband and broadband services to one *AnyMedia* Access System.
- The *AnyMedia* Element Manager (AEM) includes network management capabilities for narrowband and broadband services.
- The term GSI/AEM stands for the function of the network management system for the *AnyMedia* Access System, independent of using the GSI or the AEM.
- TL1 system interface (TL1SI) means any interface for operations using TL1 commands.

Acronyms and abbreviations

In the text acronyms are expanded the first time they are used in the main text of a chapter (for example permanent leased line (PLL)). If the acronym is a trademark, it will not be spelled out. A list of acronyms is provided at the end of this document.

Trademarks

The trademarks used in this document are identified after the title page. Trademarks used in this document are identified after the title page. Trademarks are in italics and the trademarks modify a noun. Trademarks are identified with the registered mark (®) or trademark symbol (™) the first time the trademarks are used in a chapter (for example Lucent Technologies *AnyMedia*® Access System). The trademarks of other companies are identified with a footnote reference the first time the trademarks are used in a chapter.

A trademark is not treated as an acronym (it is not spelled out or expanded).

3 Related documentation

Document list ONU installation

The following is related documentation for installation of the *AnyMedia* optical network unit:

Table 1 List of documents for the ONU installation

Component	Manual type	Comcode	CIC ordering number
AnyMedia Access System	ONU Installation Manual for Indoor Applications	108626367	363-211-150
IR-30EC and IR-40EC Series I Batteries KS-23815 (issue 7)	Product Manual	107078859	157-622-020

Document list complete

The following is related documentation for the *AnyMedia* Access System and for additional components:

Table 2 List of documents for the *AnyMedia* Access System

Item	Component	Manual type	Comcode	CIC ordering number
1	*AnyMedia* Access System	Applications and Planning Guide (APOG)	108298670	363-211-110 [a, b]
2	*AnyMedia* Access System	Ordering Guide	109097782	363-211-144 [a, b]
3	*AnyMedia* Access System	Commands and procedures for narrowband services	109105635	363-211-119 [a, b]
4	*AnyMedia* Access System	Commands and Procedures for ATM xDSL Services	109024737	363-211-133 [a, b]
5	*AnyMedia* Access System	Installation Manual (IM_AC) for AC-powered Racks	109024745	363-211-206 [a, b]
6	*AnyMedia* Access System	Installation Manual (IM_DC) for the Mainshelf and DC-powered Racks	109024752	363-211-207 [a, b]
7	Mass Provisioning Tool for V5 Services	User Manual	108408733	363-211-116 [b, c]
8	*AnyMedia* Access System, Optical Network Unit	ONU Installation Manual for Indoor Applications (ONU-IM)	108626367	363-211-150 [a, b]
9	*AnyMedia* Access System, Optical Network Unit	ONU Installation Manual for Outdoor Applications ONUO-IM)	109024778	363-211-155 [a, b]
10	*AnyMedia* Access System	Installation Manual for the 52C Outdoor Electronics Cabinet		631600294 [a]

Table 2 List of documents for the *AnyMedia* Access System

Item	Component	Manual type	Comcode	CIC ordering number
11	*AnyMedia* Access System	Description and Installation for the 92C International Indoor Electronics Cabinet		640250308 (in preparation)
12	*Navis AnyMedia* Element Management System - 30 Channel (EMS), Release 1.9	User Service Manual		363-211-495
		Customer Documentation on CD-ROM		363-211-496
13	WaveStar ADM 4/1	System Manual	108436312	365-312-550 [d]
14	LCS-V4/1 V5 (software used in combination with the WaveStar ADM 4/1)	Operation Manual	108608357	108608357 [d]
15	WaveStar AM1	Applications and Planning Guide		365-372-200 [d]
16	WaveStar AM1	User Guide		365-372-201 [d]
17	WaveStar AM1 Plus	Applications and Planning Guide (APG)	108989294	365-372-213 [d]
18	WaveStar AM1 Plus	Installation Guide (IG)	108948456	365-372-208 [d]
19	WaveStar AM1 Plus	User Operations Guide (UOG)	109003798	365-372-210 [d]
20	WaveStar AM1 Plus	Provisioning Guide (PG)	109003814	365-372-211 [d]
21	WaveStar AM1 Plus	Message & Trouble Clearing Guide (AMTCG)	109003806	365-372-209 [d]
22	CPS2000, Cabinet Power System J85582R-2	Product Manual, Issue 8	107934481	167-102-101 [e]
23	IR-30EC and IR-40EC Series I Batteries KS-23815	Product Manual	107078859	157-622-020
24	*AnyMedia* Access System	Customer Documentation on CD-ROM (comes with *Acrobat Reader*[f] 3.01 or 4.05).	108298787	363-211-114 [g]

a For the ordering address see How to order this document

b This manual is accessible from the Lucent Technologies' internal webpage: http://access.de.lucent.com/ACCESS/cdoc/index.html.

c The MPT User Manual is included in the Mass Provisioning Tool delivery. Additionally it is available in PDF format on CD-ROM.

d Ordering address: Lucent Technologies
49, rue de la republique
BP 26
F-76250 Deville les Rouen
France
Tel: +33 2 32 10 70 00
Fax: +33 2 35 74 83 23

e The CPS2000 Product Manual *cannot* be ordered separately. It is included in the CPS2000 delivery.

f *Acrobat Reader* and *Adobe* are registered trademarks of Adobe Systems Inc.

g The CD-ROM includes all manuals listed in Table 3, page -XXX.

3.1 Print copy (hard copy)

Document packaging and format

All listed documents are available in print.

3.2 CD-ROM

The Applications, Planning, and Ordering Guide, the Command and Message Manual, the User Service Manual, the Installation Manual for the rack configurations and the User Manual for the Mass Provisioning Tool are available in PDF format on CD-ROM and an Adobe *Acrobat Reader*[1] is provided to view them. *Adobe*[1] Systems distributes the *Acrobat Reader* software for free; the user does not need a license.

Table 3 Customer documentation on CD-ROM

CD-ROM	Comcode	Ordering Number
AnyMedia Access System Customer Documentation on CD-ROM includes: – Applications and Planning Guide (APOG) in pdf format – Ordering Guide in pdf format – Commands and procedures for narrowband services in HTML and in pdf format – Commands and procedures for ATM xDSL services in HTML and in pdf format – Installation Manual for the Mainshelf and for DC-Powered Racks in pdf format – Installation Manual for AC-Powered Racks in pdf format – ONU Installation Manual for Indoor Applications in pdf format – ONU Installation Manual for Outdoor Applications in pdf format – Mass Provisioning Tool for V5 Services User Manual (MPT-USM) in pdf format – Description of TL1 commands in HTML format	108298787	363-211-114 [a]

a For the ordering address see How to order this document.

1 *Acrobat Reader* and *Adobe* are registered trademarks of Adobe Systems Incorporated.

4 How to order this document

Ordering number

The ordering number for theof the *AnyMedia* optical network unit for Indoor Applications, Release R1.6/R1.11D is 363-211-150.

Order procedure

To order additional hard copies of this document and/or to request placement on the standing order list, send or call in an order as follows:

Mail order[a]	**Telephone order (Monday through Friday)**
Lucent Technologies Customer Information Center Attention: Jackie Watts, email: jswatts@lucent.com 2855 N. Franklin Road P.O. Box 19901 USA-Indianapolis, IN 46219	Phone within USA: 1-888-LUCENT-8[b] 8:30 a.m. to 5:30 p.m. EST FAX from USA: +1-800-566-9568 Phone worldwide: 1-317-322-6416 FAX worldwide: +1-317-322-6699

a For ordering, a purchase order number or charge card number is required with all orders. Make checks payable to Lucent Technologies.

b Letter-dialling (LUCENT = 582368)

One-time orders

One-time orders include the contents for the current document issue in effect at the time of order.

Standing orders

You may request an update on the standing order list for all later reissues of any document. The standing order list for each document provides automatic distribution for all reissues of the document.

5 How to comment on this document

Document comment procedure

The first sheet in this manual (after the title page) is the feedback form *How Are We Doing?*

Please use this form to fax your comments and suggestions concerning the IM, 363-211-150 to:

Lucent Technologies Network Systems GmbH
Fax no.: +49 911 526-3545

General safety information

1

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General safety information

1

1.1 Overview

Safety requirements compliance

The *AnyMedia*® Optical Network Unit (ONU) for wall-mounted indoor applications has been developed in line with the present state of the art and fulfils the current national and international safety requirements. It is provided with a high degree of operational safety resulting from many years of development experience and continuous stringent quality checks in our company.

CE marking

The *AnyMedia* Optical Network Unit fulfills the requirements of the following European directives:

- CE EMC Directive 89/336/EEC
- CE Low Voltage Directive 73/23 EEC.

Conformity is indicated by the CE marking affixed to the door of the ONU housing.

1.2 Introduction

This section lists the safety information needed to install and cable the *AnyMedia* Optical Network Unit for Indoor Applications with the ONU Subshelf, the rectifier shelf and with the batteries.

Make sure that you read this section carefully and that you understand all the safety information in this section. The safety information in this section includes:

- Important general safety instructions
- Appearance and classification of safety instructions
- Understanding electrostatic discharge (ESD) and avoiding damage from ESD

- Necessary conditions for an electromagnetic-compliant installation (EMC, electromagnetic compatibility)
- Lightwave safety
- Important general safety instructions for transporting and storage
- Important installation and wiring safety instructions
- Special safety instructions for handling batteries.

This chapter contains instructions that are to be followed during installation/mounting, operator control/operation and maintenance/repair.

The chapter **must** be read and understood by the responsible trained personnel/operator before mounting/commissioning, operation and maintenance/repair. The valid version of this document must always be kept close to the equipment/unit.

NOTE:
If you do not understand any of the safety information in this section, please see your manager immediately. You should also talk with your manager if you feel you do not understand any procedures in this manual, or if you feel you need additional training before performing any of these procedures.

Not only the general instructions in this chapter on safety must be observed, but also the specific safety instructions in the individual chapters.

Only trained service personnel should perform the procedures in this document. These procedures involve exposure to high electrical energy and/or current that may result in electric shock and/or injury to untrained personnel during servicing, maintenance, and installation of this system.

All safety instructions have a uniform appearance. This appearance is described in detail in Chapter 1.5.

NOTE:
The wall-mounted ONU for indoor applications - **as it is described in this Installation Manual** - must be connected to the AC mains which must have an approved earth terminal.
The indoor variant of the ONU is factory configured with the correct power rectifier unit which fulfills the requirement above.

NOTE:
For other applications - **not described in this Installation Manual** - the loose ONU Subshelf must be supplied with Safety Extra-Low Voltage (SELV) of –48 V and the positive terminal of this source must be correctly connected to the protective earth/GND (this means the ONU is powered externally). Never connect to supply voltage of –60 V, which will destroy the equipment.

1.3 General notes on safety

The *AnyMedia* Optical Network Unit is safe in normal operation. There are, however, some potential sources of danger that cannot be completely eliminated. In particular, these arise:

- during the:
  - — Opening of housings or equipment covers
  - — Manipulation of any kind within the equipment, even if it has been disconnected from the power supply
  - — Disconnection of optical or electrical connections
- and through possible contact with:
  - — Live parts
  - — Laser light
  - — Sharp edges, or
  - — Devices sensitive to electrostatic discharge.

1.4 General safety requirements

In order to keep the technically unavoidable residual risk to a minimum, it is imperative to observe the following rules:

- **Installation, configuration and disassembly must be carried out only by expert personnel and with reference to the respective documentation.**
  Due to the complexity of the unit/system, the personnel requires special training.
- **Any conversions or changes to the system or parts of the system (including the software/firmware) must be carried out by qualified Lucent Technologies personnel or by expert personnel authorized by Lucent Technologies.**
  All changes carried out by other persons lead to a complete exemption from liability.
  No components/spare parts must be used other than those recommended by the manufacturer and those listed in the procurement documents.
- **The unit/system must not be operated unless it is in perfect working order.**
  Any faults and errors that might affect safety must be reported immediately by the user to a person in responsibility.
- **In case of external -48V powering the loose ONU Subshelf must be supplied with Safety Extra-Low Voltage (SELV) of -48 V and the positive terminal of this source must be correctly connected to the protective earth.**
  Never connect to –60 V to the loose ONU Subshelf.

- **The *AnyMedia* Optical Network Unit must be operated only with the connections and under the environmental conditions as described in the documentation.**
- **The removal or disabling of safety facilities, the clearing of faults and errors, and the maintenance of the equipment must be carried out by specially qualified personnel *only*.**
  The respective parts of the documentation must be strictly observed.
  The documentation must also be consulted during the selection of measuring and test equipment.
- **Transport, storage and operation of the *AnyMedia*** Optical Network Unit **must be done under the permissible conditions only.**
  See accompanying documentation and information on the unit/system.
- **Calibrations, special tests after repairs and regular safety checks must be carried out, documented and archived**.
- **Do not place the shelves or the wall-mounted enclosure on an unstable cart, stand, or table.**
  The product may fall causing serious damage to the equipment.
- **Never push objects of any kind into the *AnyMedia* Optical Network Unit through enclosure slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.**
- The batteries are connected in parallel with the output of the power rectifier unit (PRU) via the low voltage disconnect unit (LVD). Removing the PRU alone (or disconnecting the AC power cord) or switching off the LVD alone will not necessarily remove the power to the ONU equipment.
  For deenergizing power completely the switch on the LVD must be switched to "OFF" and the AC power cord must be disconnected from the PRU. To disconnect the batteries completely also on the LVD the battery fuse must be removed or the battery connector J3 must be disconnected after the LVD has been switched off.

1.5 Appearance of the safety instructions

All safety instructions include a **signal word** that classifies the danger and a **text block** that contains descriptions of the type and cause of the danger, the consequences of ignoring the safety instruction and the measures that can be taken to minimize the danger. In some safety instructions, a **warning symbol** is placed underneath the signal word (see also Chapter 1.7).

Example 1:

DANGER: **Arcing on removing or inserting a live power supply plug.**

Arcing can cause burns to the hands and damage to the eyes.
Ensure that the line circuit-breaker on the fuse panel is in the "OFF" position before removing or inserting the power supply plug.

Example 2:

IMPORTANT: **Destruction of components by incorrect handling.**

The power should be turned off before inserting or removing a pack, unless otherwise specified.
Before replacing a circuit pack, check the identification code to ensure that the proper pack is being used.

1.6 Classification of safety instructions

Danger classification

There are five classes of safety instructions: “Danger”, “Warning”, “Caution”, “Important” and “Notice”; which class is relevant depends on the consequences of ignoring the safety instruction:

DANGER	Serious injury is definite or likely.
WARNING	Serious injury is possible.
CAUTION	Minor injury is definite, likely or possible, or material damage to the product or in the product environment is definite or likely.
IMPORTANT	Material damage to the product or in the product environment is possible.
NOTICE	A fault, that is, considerable impairment to operation, will be caused or may be caused.

1.7 Warning symbols

The following warning symbols are used:

Table 1 Warning symbols

Symbol	Common application
	General warning about a danger
	Warning about a dangerous electrical voltage
	Warning about laser radiation

Table 1 Warning symbols

Symbol	Common application
	Warning about explosion
	Warning about battery acid
	Warning about devices sensitive to electrostatic discharge (ESD)

The safety instructions for the classes “Danger”, “Warning” and “Caution” always have a warning symbol, the “Important” and “Notice” safety instructions can, but do not always have a warning symbol.

Special safety instructions

The aspects of “handling of components sensitive to electrostatic discharge (ESD)” and “laser safety” are of vital importance for equipment in the *AnyMedia* Access System. The key safety instructions for these subjects are summarized in Chapter 1.8 and Chapter 1.10.

1.8 Handling components sensitive to electrostatic discharge

1.8.1 ESD consequences

All semiconductor components are basically sensitive to static charges. Most circuit pack integrated circuit (IC) damage can be attributed to a discharge of static electricity.

For a person to feel the discharge of static electricity, a minimum level of 3500 volts must exist. A person walking across a floor can generate electrostatic voltages in excess of 5000 volts. Tests have shown that ICs can be damaged by discharges of less than 100 volts. Since electrostatic discharges (ESD) contain little or no current, there is no employee safety hazard.

Electrostatic discharge, for example caused by touching with the hand, can destroy semiconductor components. The correct operation of the complete system is then no longer assured. Identifying ESD damage can be difficult because in most cases, physical damage cannot be seen. A pack which has been exposed to an ESD may:

- Not be affected, that is, work perfectly with normal life expectancy
- Function normally, but with reduced life expectancy
- Function erratically at times
- Stop functioning altogether.

NOTE:
Static discharges may also result from other sources. If a piece of plastic is placed near one end of a circuit pack lying on an insulated table top, it can direct its charge into the circuit pack.

Packs and other equipment containing components that are especially sensitive to electrostatic discharge are identified by warning labels bearing the barred-hand symbol:

ESD wrist strap

To reduce the possibility of ESD damage, the shelves are equipped with a grounding jack to enable personnel to ground themselves using wrist straps with a minimum resistance of 250 kΩ while handling circuit packs or working on a shelf/shelves. The jacks are located on the right of the ONU Subshelf and are accessible from the front. When grounding jacks are not provided, an alligator clip adapter enables connection to the housing frameground (FRMGND).

NOTE:
Inside the *AnyMedia* Optical Network Unit an ESD earth socket and an ESD sticker are supplied. On the right side of the ONU Subshelf an ESD bonding point for an ESD wrist strap is present. It is mounted so that it is always accessible for installation, normal operation and maintenance activity.

The wrist strap (ESD strap) must be worn and connected to the ESP bonding point when opening the ONU door.

The wrist strap must have a resistance between 250 kΩ and 1.5 MΩ.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. The wrist strap used must be checked periodically for a resistance between 250 kΩ and 1.5 MΩ to avoid electrostatic discharge.
Therefore before using the wrist strap check the wrist strap for shorts, opens, and proper resistance value. For checking follow local regulations or regulations given by the network provider. Do not use a wrist strap that does not pass these checks.

The following figure shows an ESD wrist strap.

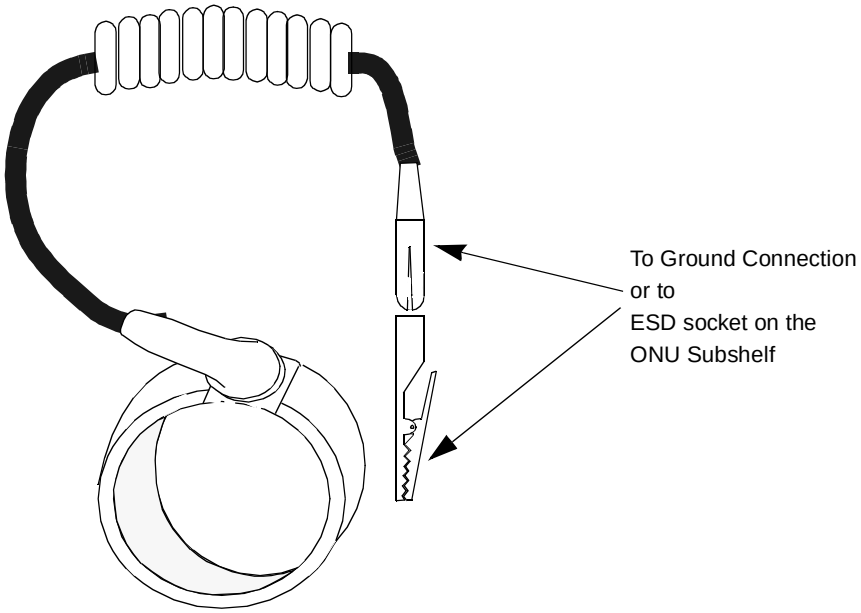

Figure 1-2 ESD wrist strap

1.8.2 ESD safety guidelines

Observe the following ESD instructions to avoid damage to components sensitive to electrostatic discharge:

- Ensure that the ONU housing is grounded properly.
- Wear conductively connected wrist straps and connect them to the ONU Subshelf ESP bonding point.
- Work in an area which is protected against electrostatic discharge. Use conducting floor and bench mats which are conductively connected to the rack ESP bonding point.
- Conductively connect all test equipment and trolleys to the rack ESP bonding point.
- Wear working garments made of 100% cotton to avoid electrostatic discharge.
- Touch the packs with previously discharged hands (wrist strap) at the edges or the insertion and removal facilities/card pullers only.
- Store and ship packs and components in their shipping packaging. Packs and components must be packed and unpacked only at workplaces suitably protected against build-up of charge.

- Never place circuit packs on ungrounded metal shelving or on ungrounded portable carts without insulated surfaces.
- Return items for repair in suitable antistatic packaging only.
- Do not rub or wipe circuit packs containing ICs to clean them or their contacts unless both the individual and the circuit pack are the same ground potential.
- Work areas must be kept clear of common plastics, a major source of static electricity. When rubbed or handled, these plastics produce a static charge that will not readily dissipate when grounded. These plastics must not make direct contact with ICs or circuit packs. Common plastic materials in this classification include polystyrene packing containers, clear plastic bags, plastic drinking cups, food wrappers, notebooks, and nonconductive plastic solder suckers. (The plastic insulation on small hand tools does not represent a static hazard.)

In an emergency and only in an emergency, when a properly functioning wrist strap is not available at the job site, the following "touch-ground" procedure should be used for handling packs containing electronic components.

- Always touch ground (exposed) metal before handling a pack in any way (that is, inserting, removing, or storing). This must be done just prior to touching the pack. Moving around will necessitate repeating this procedure. Note that painted surfaces are not good ground points.
- Handle packs only by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, leads, or connector pins.
- Put the pack into an antistatic bag or carton immediately upon removing it from a shelf.

1.9 Necessary conditions for an EMC-compliant installation

All the equipment of the *AnyMedia* Access System is designed only to work in mesh-BN[1] or mesh-IBN[2] environments which comply with ETS 300 253. The conditions include the following:

- The framework (FRMGND, identical to the metalwork) of the ONU Subshelf, the rectifier shelf and the ONU housing have to be connected to each other. For the wall-mounted ONU for indoor applications - as it is described in this Installation Manual - they are connected at delivery already.
- The housing has to be connected to the protective earth (PE) and to the bonding wire (approved earth electrode/terminal) during installation.

1 Meshed bonding network

2 Meshed isolated bonding network

- FRMGND and the -48 V return path (-48RTN) of the ONU have to be connected together. For the wall-mounted ONU for indoor applications - as it is described in this Installation Manual - they are connected with a single wire at delivery already.
- The ring return path (tip wire, TRG0) of the ringing voltage has to be earthed at the ringing source side (and is therefore connected to the -48RTN). For the wall-mounted ONU for indoor applications using the ringing generator unit (RGU) - as it is described in this Installation Manual - they are invisibly connected inside the RGU at delivery already.

Earthing

WARNING: **Risk of injury due to disconnected ground.**

The installation must have an independent ground connection to an approved earth electrode for outdoor applications. Grounding circuit continuity is vital for safe operation of the AnyMedia Optical Network Unit.
The minimum size of the independent ground connection should be ≥16 mm^2 or ≤AWG 6.
For grounding also the ITU recommendation ITU-K.35[a] should be considered.
The framework must be correctly connected to the approved earth before the start of work.
Never operate the AnyMedia Optical Network Unit with a disconnected ground.

a Bonding Configurations and Earthing at Remote Electronic Sites

The housing of all connectors will always be connected with frameground (FRMGND). Every shielding is connected to FRMGND. The CE-marked ONUs need the EMC-proof connecting material, such as shielded cables and metallic or conductive D-sub connector hoods, to meet the CE directives.

1.9.1 Cables

All external cables except the a/b-cables of the application packs (AP) must be shielded and must be equipped with EMC-tight connectors.

If EMC screening is needed for a/b-cables, a 32 × 2-pair cable with EMC screening or a partly shielded cable has to be used per AP faceplate connector. The partly shielded a/b-cables must be shielded for about 600 mm from the AP connector downwards. The screen has to be attached to the sheet metal of the ONU Subshelf. The a/b-cables ED7C818-30Gr1x are designed for partly shielding. If cables connected to APs have an exposed shield then this shield must be brought in metallic contact with the grounding finger below the AP via cable ties.

For connecting a PC GSI to the optical controller pack (OCP) via the RMC connector (RS-232C), a 9-pin D-sub connector with angled housing should be connected to ease the cable routing.

All a/b-cables and xDSL-cables should not leave the building premises unless connected to telecommunication devices providing primary protection (e.g. protector blocks with gas discharge tubes) as applicable.

1.9.2 Internal powering via AC mains (delivery variant)

For internal powering the ONU is supplied by an internal power rectifier unit (PRU) which is fed by AC mains and buffered by batteries.

This delivery variant of the wall-mounted ONU for indoor applications is delivered and therefore described in this Installation Manual.

The external mains source must be fuse protected for line protection:

- nominal value for 110 V AC: 13 A to 16 A,

or

- nominal value for 220/240 V AC: 10 A to 16 A,

where

- the tripping current must be ≤ 1.4 x nominal fusing value.

The power rating for the ONU is:

- 100 - 127 / 200 - 240 V AC nominal, 10 / 5 A.

NOTE:
The 540 W power rectifier unit for the indoor ONU is situated for operating in over voltage category II (according to IEC 60664-1) locations. Mains transients may never cross 2.5 kV. Additional surge arrestors may be required depending on the site conditions.

If a ringing source is required the ringing generator unit (RGU) can be used for internal ringing. The RGU is located in the ONU Subshelf in the slot position where for other, future applications the power filter unit (PFU) can be inserted alternatively.

If the ringing generator unit RGU500 is used the -48 V return path (-48RTN) and the ringing return path (TRG0) are connected inside the RGU. This connection is invisible. If the RGU is removed this connection does not exist anymore.

FRMGND and the -48 V return path (-48VRTN) are connected on the backplane of the rectifier shelf. Additionally both potentials are crossconnected by factory installed wire.

1.9.3 External -48V powering, external ringing

For the standard application external powering and ringing are not supported currently for indoor applications. For future applications the ONU can easily be adapted for these variants.

1.10 Handling components with lasers and fibers

1.10.1 General laser information

In its normal operating mode the used lightwave system of the *AnyMedia* Optical Network Unit is totally enclosed. It is a Laser Class 1/I product under the IEC schemes, for different laser classes see Chapter 1.10.3. The wavelengths used are between 800 nm and 1600 nm, the laser radiation emitted is <10 mW at maximum.

Laser safety

CAUTION: **Injury to eyes caused by invisible laser radiation.**

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
Don't look into the end of an exposed fiber or optical connector of a pack as long as the optical source is switched on.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized.*
Always observe the laser warning instructions (see page 1-13).

A conventional laser produces a small beam of light, and because the beam is small the power density is very high. Lasers used in ONU lightwave systems are usually Class 1 lasers and have a larger beam divergence, typically 10 to 20 degrees. Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 250 mm (≈10 inches) will normally not cause eye injury. However, damage may occur if an optical instrument such as a microscope, magnifying glass or eye loupe is used to view the energized fiber end.

Lightwave digital transmission systems and associated optical test sets may use semiconductor laser transmitters not belonging to Class 1 lasers. The lasers emit lightwaves into lightguide cables, at or near infrared wavelengths that are invisible to the human eye.

Light energy emitted by laser and high-radiance LEDs may cause eye damage if absorbed by the eye's retina. When a beam of light enters the eye, the eye magnifies and focuses the energy increasing the damage and may cause a retinal burn. The damage mechanism at the wavelengths used in telecommunications is thermal in origin, that is, damage caused by heating. Therefore, a specific amount of energy is required for a definite time to heat an area of retinal tissue.

1.10.2 Laser safety guidelines

Safety instructions

In its normal operating mode, a lightwave system is totally enclosed and presents no risk of eye injury. It is a Laser Class 1/I product under the IEC schemes.

Laser safety

CAUTION:

Injury to eyes caused by invisible laser radiation.

Although, at present, the transmitting power levels for Laser Class 1 are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
Always observe the laser warning instructions (see instructions below).

The lightguide cables that interconnect various components of a lightwave system can be disconnected or break, and may expose people to lightwave emission. Also, certain measures and service procedures may expose the technician to emission from the laser circuit pack during installation and servicing.

Observe the following instructions to avoid exposing yourself and others to risk:

- Don't look into the end of an exposed fibre or an open connector as long as the optical source is still switched on. Even for Class 1 lasers viewing with the unaided eye at distances greater than 250 mm (≈10 inches) will normally not cause eye injury.
- Under no circumstances shall lightwave/lightguide operations shall be performed by a technician before satisfactorily completing an approved training course. Only authorized, trained personnel shall be permitted to carry out service, maintenance and restoration activities.
- Read the relevant descriptions in the manuals before taking equipment into operation or carrying out any installation and maintenance work on the optical packs, and follow the instructions.
  Ignoring the instructions can result in exposure to dangerous radiation.
- If you are not sure that the fiber is connected to a Laser Class I product ensure that the optical source is switched off before disconnecting optical fiber connectors.
- Under no circumstances shall any personnel scan a fiber with an optical test set without verifying that all lightwave sources on the fiber are turned off or the that test set is specially approved for this test.
- In the event of doubt, check that the optical source is switched off by measuring with an optical power meter.
- If the fiber will be disconnected from the optical controller pack always put the protective cup on the optical connectors of the fiber and the optical controller pack.

1.10.3 Classification of lasers

Laser classes

The laser classes are defined in standards such as IEC 60825 (or EN 60825) and its supplements. A maximum laser radiation is defined for each laser class according to the wavelength. The maximum laser radiation depends on the type of laser diode used. This results in different laser classes for the various optical plug-in units.

These standards require manufacturers to classify their laser products as belonging to one of the major classes, classes 1, 2, 3A, and 3B. Manufacturers of lasers and laser products in the U.S. are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. Classification schemes are similar to the IEC with categories such as class I, II, IIa, IIIa or IIIb. In both cases, laser products are classified according to the accessible emission levels and their potential for causing injury.

Table 1-1 Laser classes to IEC 60825 and DIN/EN 60825

Laser class	Wavelength	Max. laser radiation
Class 1	1300 nm	8.85 mW
Class 1	1550 nm	10 mW
Class 3A	1300 nm	31 mW
Class 3A	1550 nm	50 mW
Class k x 3A	1300 nm	81 mW
Class k x 3A	1550 nm	50 mW
Class 3B	1300 nm	0.5 W
Class 3B	1550 nm	0.5 W

Laser warning labels

Optical transmission systems are identified by yellow laser warning labels on which only the laser class (see Figure 1-3) is indicated.

Lightwave systems are generally classified as class 1/I, because, under normal operating conditions, all energized laser transmitting circuit packs are terminated on optical fibers which enclose the laser energy with the fiber sheath forming a protective housing. Also, covers are typically in place over the circuit pack shelves.

The label shown below is used to identify systems belonging to laser class 1 in normal operation.

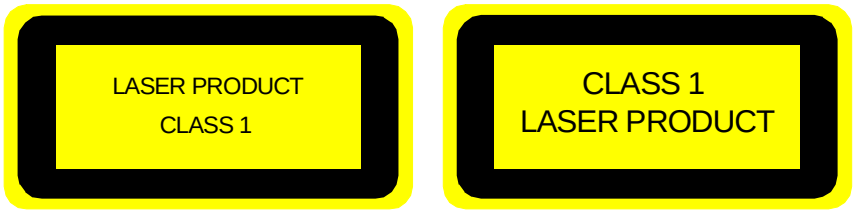

Figure 1-3 Laser warning labels for Class 1 lasers

Appropriate labels are also available for the remaining laser classes (k x 3A, 3B); each label indicates the laser class, wavelength and maximum laser radiation. These labels are affixed in a clearly visible position on the equipment.

NOTE:
The *AnyMedia* Access System equipped with optical packs (OAP or OCP) is completely classified as a Class 1 laser product.

The following laser warning symbols can be affixed to the optical packs. The optical connectors from which laser radiation can be emitted can be identified by a laser warning symbol near the connector:

Due to lack of space, laser warning labels cannot be affixed to the potential source of laser radiation, that is, directly to the optical connectors. Figure 1-4 therefore illustrates the optical connectors which can be a source of laser radiation.

Note: Example, connector arrangement can differ, housing removed

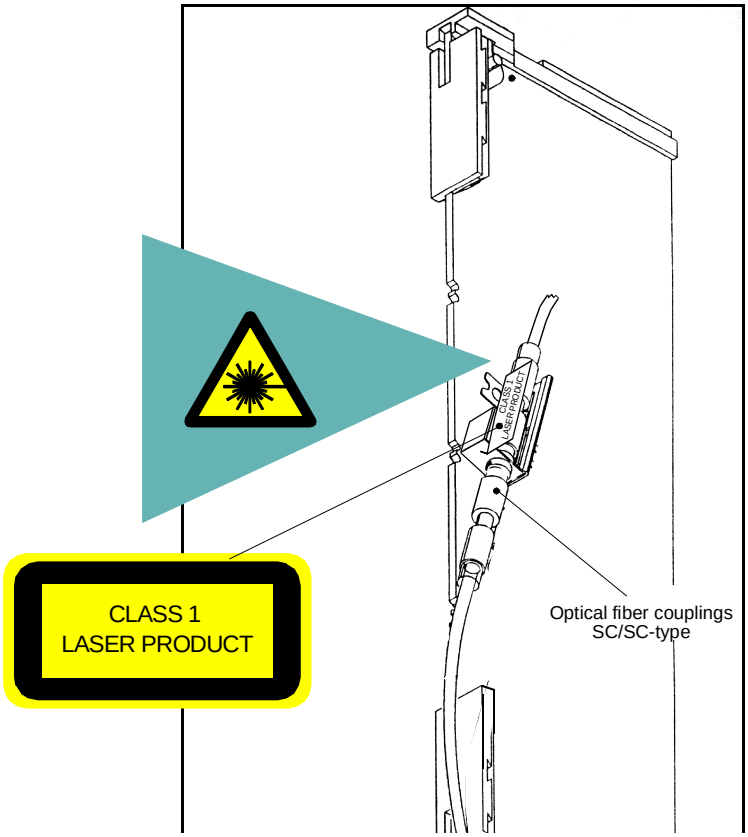

Figure 1-4 Optical connectors on the optical controller pack (example)

1.10.4 Handling fibers

Never look into the end of an exposed fiber or optical connector of a pack as long as the optical source is switched on. Always observe the laser warning instructions.

Splicing

Cutting and splicing fibers must be followed and performed by trained personnel only. Read and understand all instructions of the manual of the splicing and cutting equipment.

Before splicing verify the fiber is disconnected from the optical pack unit.

After cutting/splicing, every splice has to be checked. Follow the instructions of the manual of the splicing and cutting equipment.

Optical fiber splinters

WARNING:

Injury to eyes caused by broken-off fiber ends.

When splicing optical fibers, fiber ends can easily break off and get in your eyes. This can cause eye damage.
Make sure that no broken-off fiber ends get in your eyes. If required use safety goggles for fiber splicing. Place broken-off fiber ends in a sealed container immediately after you cut them off.

Routing and connecting

During installation of fibers the optical connectors of fibers and OCP must be equipped with a protective cap until the connectors are coupled.

The fibers should by guided to the optical packs using the special protective spiral wrap of the pigtail on the ONU side.

If the fiber is routed from bottom to an optical connector take care if the fiber has to be disconnected so that the fiber will not hang out of the ONU Subshelf and can be bent or broken.

Optical cable break

IMPORTANT:

Fiber microdefects and/or cable break with a bending radius less than 30 mm.

There is a risk to cause microdefects in the single fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius for the single fiber is not less than 30 mm.
Always use the special protective spiral wrap of the delivered fiber pigtail to the OCP.
For the outdoor or office fiber cables the allowed bending radius depending on the cable used must be observed.

1.10.5 Cleaning optical connectors and couplings

Cleaning optical connectors is required only if problems have occurred which indicate that these connectors have an impurity (for example deviation of attenuation values beyond the permitted maximum).

Checking fiber connectors

Before starting to clean the optical connectors, ensure that the optical source is switched off. Never look into the end of an exposed fiber or optical connector of a pack as long as the optical source is switched on. Always observe the laser warning instructions.

To check for impurities (for example fluff, dust particles, ...), use a microscope with an enlargement factor of 200, so that the connector face can be inspected.

Checking optical couplers

Visually check the coupling for residual impurities by holding it to the light (the geometry of the coupling does not allow the coupling to be checked under the microscope). After cleaning with a pipe cleaner do not connect the optical connectors/couplings without checking them for impurities.

Use isopropanol for cleaning. Let the connector/coupling face air-dry or use purified compressed air (the isopropanol must evaporate completely!).

1.10.6 Handling the optical controller pack (OCP)

The OCP does **not** have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.

Laser safety

WARNING: **Injury to eyes caused by invisible laser radiation.**

The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
***Never** view any unterminated optical connector with optical microscope or magnifying glasses as long as the laser source is switched on. **Always** test with an optical power meter or infrared detectors that the fiber is deenergized and ensure that the laser source can not be activated during inspection with the microscope.*

For receiving and transmitting a single fiber is used carrying two wavelength of 1310 nm and 1500 nm.

In normal operation the OCP is classified as belonging to laser Class 1. The lightguide cables can be disconnected or break, and may expose people to lightwave emission. Therefore:

- Disconnect the fiber from the OCP and remove the OCP from the subrack before working on the optical fiber or connectors inside the pack
- Never look into an unterminated optical fiber or connector directly without first checking that the laser has been turned off.
- Inadvertently viewing an unterminated fiber or damaged fiber with the unaided eye at distances greater than 250 mm (≈10 inches) will normally not cause eye injury with Class 1 lasers.
- If the OCP is powered the internal laser of the OCP will work. If the fiber is connected to the OCP and the yellow CLF LED lights the fiber is broken or not connected, or the OAP in the *AnyMedia* Mainshelf does not work.

1.11 Handling batteries

1.11.1 General precautions valid for all battery types

Always use the following basic precautions:

- Use only properly insulated tools and test equipment.

- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses, acid-resistant gloves, rubber overshoes and apron.
- Test circuits before touching.
- Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn-on.
- Be aware of potential hazards before servicing equipment. A tool or other metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring.).
- Always verify the polarity before connecting cables to the batteries.
- Use care when removing or replacing any covers; avoid contacting any circuits.

While unpacking and/or installing the batteries, you must:

- NEVER place metal objects (including tools) on top of a battery.
- NEVER short out the battery's terminals.
- NEVER tamper with or block the battery vent caps, if equipped.
- NEVER use an open flame near batteries.
- NEVER smoke near batteries.
- NEVER stack batteries (in or out of their shipping cartons).

Hydrogen gas

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. An explosion could occur when sparks are created near the battery string. Therefore do not install batteries in totally sealed enclosures.

Battery terminals

Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections. Always consider the maximum torque specified by the battery manufacturer.

Taking voltage readings

Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken. Review the safety precautions.

Acid spillage

If large acid spillage occurs, use agricultural or industrial lime instead of soda for neutralization before clean-up. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after clean-up.

Short circuit

WARNING:

Risk of a short or arcing due to battery cabling without fuse protection.

The battery cabling is normally not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an arc destruction of batteries and cables and thus malfunctioning of the complete ONU.

1.11.2 Special considerations for the Tyco IR-30EC batteries

Tyco IR batteries are valve regulated rechargeable stationary lead-acid batteries which are conditioned at delivery. The IR-30EC battery has recessed bolt type terminals and a raised cover design to prevent shorting terminals.

GMT-type fuse

The GMT-type fuse in the low voltage disconnect unit (LVD) can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only GMT-type fuses delivered by Tyco.

The IR-30EC batteries are provided with a 14AWG assembly terminating with 2-pin AMP keyed connector (protected against confusing poles).

Cable assembly destruction

WARNING:

Destruction of IR-30EC cable assemblies for improper external charging.

The standard cable assembly mounted to the IR-30EC batteries is designed only for charging currents below 15 A. Charging currents exceeding 18 A will destroy the cable.
If the battery is charged externally the charging current of the external charger must not exceed 18 A under any circumstances if the delivered cable assembly is used.

Boost charging IR-30EC batteries

IMPORTANT:

Water loss due to electrolysis caused by boost charging.

During boost charging water loss is increased and can result in premature failures caused by cell dry-out.
Boost charging the IR-30EC batteries is not recommended without the concurrence of Tyco. Refer to the Product Manual for IR-30EC and IR-40EC Batteries, Section Operations.

During installation consider the following warnings:

Short circuit

DANGER:

Destruction of batteries in the event of a short circuit.

A short circuit of the batteries will cause an arc destruction of batteries and cables and thus malfunctioning of the complete ONU.
Be aware of potential hazards before servicing battery equipment.
You must therefore always use properly insulated tools and test equipment for installing and connecting batteries.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Short circuit and arcing in the batteries area

DANGER:

Destruction of batteries in the event of a short circuit.

A short circuit in the batteries will cause an arc destruction of batteries and cables and thus malfunctioning of the complete system.
Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Never short out the battery's terminals.
Always verify the polarity before connecting cables to the battery poles in the event of servicing. The keyed 2-pin cable connector of the IR-30EC battery is protected against confusing poles.
You must always use properly insulated tools and test equipment for installing and connecting batteries.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Arcing

WARNING:

Arcing on removing or inserting a live battery connecting cable.

Arcing can cause burns to the hands and damage to the eyes or destroy the coating of the cable connectors.
Ensure that the battery circuit-breaker on the LVD is in the "OFF" position before disconnecting a battery cable.

Short circuit when taking voltage readings

WARNING:

Risk of a short or arcing due to battery cabling without fuse protection.

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an destruction by arcing of batteries and cables and thus malfunctioning of the complete ONU.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded.
Never remove connections at the meter end without first disconnecting the test leads from the battery.
Use insulated probes for measuring.
Remove test lead connections at the battery immediately after each reading is taken.

Weight

WARNING: **Risk of injury due to battery weight.**

A battery can weigh up to 10.5 kg and can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the shelf/batteries.

Explosion hazard

WARNING: **Risk of explosion due to charging batteries.**

Battery gases developing while charging the battery may ignite as a result of sparking during the disconnection or connection of cables. This can cause considerable damage and injuries.
Smoking, fire, sparking and naked light is therefore strictly forbidden within the proximity of the batteries (≤0.5m). Also discharge all static electricity from your body before performing any work.
The ventilation of the batteries is therefore ensured via the ventilation openings in the ONU housing.
Never cover up these ventilation openings. Never house the complete ONU in a sealed enclosure.
As always, adequate ventilation must be provided.

Sulfuric acid

WARNING: **Risk of corrosion to skin due to damaged battery housing/First Aid**

The batteries contain sulfuric acid gel which may cause corrosion to skin.
Do not damage the battery housing.
In the event of electrolytic contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water.
In the event of electrolyte in the eye, pour water into the eye and allow at least 1 liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

Sulfuric acid

IMPORTANT: **Acid spillage cleanup.**

Acid spillage from batteries must be cleaned up and disposed of in accordance with the local regulations.
If large acid spillage occurs, use agricultural or industrial lime instead of soda for neutralization before cleanup. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after cleanup.

1.12 Handling the rectifier shelf of the ONU

High leakage currents and high voltages may be possible on the rectifier shelf especially if batteries are connected. Make sure the ONU housing and the rectifier shelf are properly safety earth grounded before connecting power. Hazardous en-

ergy and voltages are present in the rectifier shelf and on the AC mains cable that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment.

High voltage feeding

The power rectifier unit (PRU) is connected to the 100/240 V AC mains via the IEC60320 AC mains inlet and the delivered power cord. The AC mains connector and the AC power cord carry hazardous voltage. Exercise care when servicing in this area.

NOTE:
For the first deliveries there are rectifiers with an IEC 320 AC inlet. These rectifiers require a power cord with the appropriate IEC 320 plug.

High voltage

DANGER:

Dangerous voltage.

The ONU rectifier shelf is fed by AC mains of 110 to 240 V AC. Touching live parts will shock or cause serious injury or death.
Take care when servicing in this area.
Follow all safety warnings and local regulation practices.

NOTE:
External AC mains fusing is required for line protection. The 540 W power rectifier unit for the indoor ONU is situated for operating in over voltage category II (according to IEC 60664-1) locations. Mains transients may never cross 2.5 kV. Additional surge arrestors may be required depending on the site conditions.

If a ringing source is required the ringing generator unit (RGU) can be used for internal ringing. The RGU can be inserted in the ONU Subshelf in the upper left slot position.

Power buffering and disconnecting

The IR-30EC batteries are connected in series to the low voltage disconnect unit (LVD). For the ONU Subshelf connected to batteries via the rectifier backplane, disconnecting the AC mains alone or turning off the batteries via the battery circuit breaker on the LVD will **not** necessarily remove power to the ONU. Make sure the equipment is not powered by the rectifier and that the batteries are not connected to the ONU. For disconnecting power completely the AC mains connector must be disconnected **and** the battery circuit breaker on the LVD must be switched to "OFF". The battery circuit breaker is of single-pole switching type. The -48V path is disconnected by the battery circuit breaker, the -48VRTN path is fuse protected on the LVD by a front accessible GMT-type fuse of 15 A additionally.

GMT-type fuse

The GMT-type fuse in the low voltage disconnect unit (LVD) can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only GMT-type fuses delivered by Tyco.

The battery cable should be dressed and strain-relieved to avoid damage to the conductors (caused by routing around sharp edges or routing in areas where wires could get pinched) and undue stress on the connectors.

NOTE:
The battery connections from the battery to the LVD are not fuse-protected.

Output connectors should not be disconnected under load unless otherwise specified.

1.13 Transport and storage warnings

Observe the following instructions for safe transportation and storage:

Weight

WARNING:

Risk of injury due to unsecured ONU.

The delivered ONU with the packaging weighs up to 200 kg.
The delivered ONU housing partly equipped - without packaging as it has to be mounted to the wall - weighs up to 25 kg.
The ONU completely installed and equipped with the batteries weighs up to 75 kg.
The ONU can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the already installed shelves.
Use a sturdy vehicle for transport and secure the ONU against being dropped.
Two persons are required for lifting the ONU for mounting to the wall.
Do not store more than one packaged ONU on top of the other.
Never lift the ONU equipped with batteries.

Packaging

IMPORTANT:

Adverse effect on operation due to incorrect packaging.

Dampness and soiling can cause corrosion or tracking paths. This can cause malfunctioning of the system components. Shocks can cause damage.
Protect the system components against dampness, soiling and shocks. Use the original packaging if possible.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge.
Packs must therefore always be kept in antistatic covers. Use the original packaging if possible.
Always observe the ESD instructions (see page 1-8).

Climatic conditions

IMPORTANT:

Damage to packs under extreme environmental conditions.

Extreme environmental conditions can damage packs and cause malfunctioning.
Ensure that the limits shown in Figure 1-5 according to ETS 300 019-1-2, climatic class 2.3, are complied with during transport.
Ensure that the limits shown in Figure 1-6 according to ETS 300 019-1-3, climatic class 1.2, are complied with during storage.

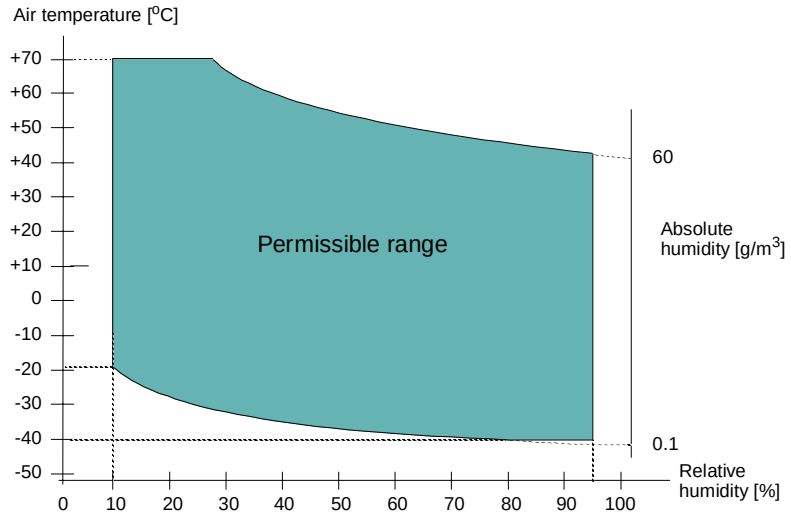

Figure 1-5 Climatogram according to ETS 300 019-1-2, Class 2.3, for public transportation

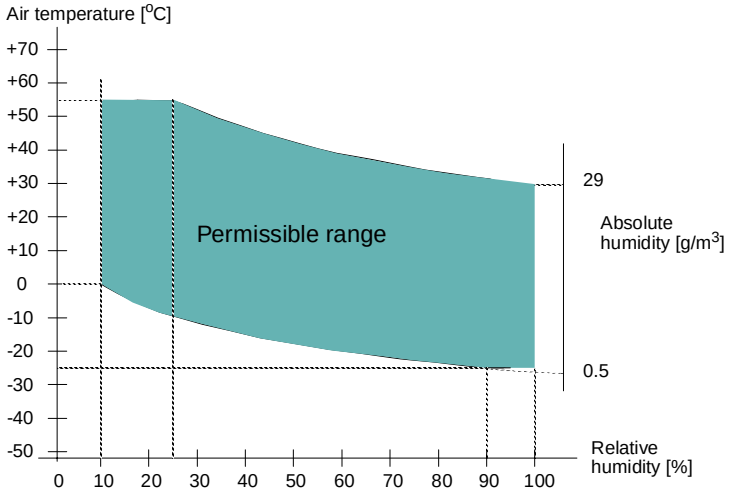

Figure 1-6 Climatogram according to ETS 300 019-1-1, Class 1.2, for weather-protected, not temperature-controlled storage locations

1.14 General installation warnings

Observe the following instructions for safe installation and mounting:

Trained personnel

WARNING:

Risk of injury due to untrained personnel.

Installation and maintenance procedures must be followed and performed by trained personnel only. Do not allow non-service personnel to access electrical wiring.
Read and understand all instructions and warning labels.
Follow all warnings and instructions marked on the product and in the manuals.

Weight

WARNING:

Risk of injury due to unsecured ONU.

The delivered ONU with the packaging weights up to 200 kg.
The delivered ONU housing partly equipped - without packaging as it has to be mounted to the wall - weighs up to 25 kg.
The ONU completely installed and equipped with the batteries weighs up to 75 kg.
The ONU can cause considerable injuries if it is knocked over or dropped.
This can also cause serious damage to the already installed shelves.
Use a sturdy vehicle for transport and secure the ONU against being dropped.
Two persons are required for lifting the ONU for mounting to the wall.
Do not store more than one packaged ONU on top of the other.
Never lift the ONU equipped with batteries.

Laser warning labels

WARNING:

Ineffectiveness of laser warning labels if removed or concealed.

Warning labels on the optical components warn of the dangers of invisible laser radiation.
Removed, concealed or illegible labels can lead to incorrect action and thus cause serious injuries to the eyes of operating staff.
Ensure that the laser warning labels are not removed or concealed and always clearly legible.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. The wrist strap used must be checked periodically for a resistance between 250 kΩ and 1.5 MΩ to avoid electrostatic discharge.
Therefore before using the wrist strap check the wrist strap for shorts, opens, and proper resistance value. For checking follow local regulations or regulations given by the network provider. Do not use a wrist strap that does not pass these checks.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge.
Hold packs only at the edges or on the insertion and removal facilities.
Always observe the ESD instructions (see page 1-8).

Overheating

CAUTION:

Risk of fire due to overheating.

Inadequate heat dissipation can cause heat accumulation or even a fire in the AnyMedia Optical Network Unit.
You must therefore ensure that

- *the ventilation openings in the door of the ONU housing are not covered up.*
- *the minimum separation (35 mm) is ensured between the top of the ONU Subshelf and the ONU housing.*
- *all slots in the ONU Subshelf which are not equipped with application packs are closed with blank faceplates.*
- *the installed fan unit works properly, because the natural convection does not ensure the necessary ventilation.*

Fire or electrical shock

WARNING:

Risk of fire or electrical shock.

Objects of any kind pushed through openings in the ONU housing or in the shelves may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock.
You must therefore ensure that

- *objects of any kind are never pushed into the shelves.*
- *liquid of any kind is never spilled on the shelves.*

Condensation

IMPORTANT:

Condensation causes malfunctioning.

Condensation can occur in the AnyMedia Access System, especially during transport on moving from the outside to closed rooms; this can cause malfunctioning of the packs.
Ensure that packs and shelves have reached room temperature and are dry before taking them into operation.
Never spill liquid of any kind on the product.

1.15 General wiring warnings

Trained personnel

WARNING:

Risk of injury due to untrained personnel.

Installation and maintenance procedures must be followed and performed by trained personnel only. Do not allow non-service personnel to access electrical wiring.
Read and understand all instructions and warning labels.
Follow all warnings and instructions marked on the product and in the manuals.

High voltage

WARNING:

Dangerous voltage.

The power rectifier unit of the ONU is fed by AC mains of 110 V up to 240 V AC. Touching live parts will shock or cause serious injury or death.
Take care when servicing in this area.
Follow all safety warnings and local regulation practices.

High ringing voltage

WARNING:

Dangerous ringing voltage.

The AnyMedia Optical Network Unit can be fed by ringing voltages of 57 V DC maximum superimposed up to 105 V AC maximum. Touching live ringing cables will shock or cause serious injury or death.
Take care when servicing in this area.
Follow all safety warnings and local regulation practices.

Touching cables

WARNING:

Risk of injury due to touching uninsulated cables routing outside the building.

Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected.
Never touch uninsulated wiring or terminals carrying direct current or ringing current or leave this wiring exposed. Protect and tape those wires and terminals to avoid risk of fire, electrical shock, and injury to service personnel.

Connecting cables

WARNING:

Risk of injury due to installation of cables routing outside the building during a storm or in wet locations.

Never install telecommunication wiring during a lightning storm.
Never install telecommunication connections in wet locations.

Connecting cables and primary protection/protector blocks

CAUTION:

Destruction of components due to installed cables without protection.

All a/b-cables, E1-, E3/DS3, xDSL-cables and the alarming cabling should not leave the building premises unless connected to telecommunication devices providing primary protection (e.g. protector blocks with gas discharge tubes) as applicable.

Optical cable break

IMPORTANT:

Fiber microdefects and/or cable break with a bending radius less than 30 mm.

There is a risk to cause microdefects in the fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius is not less than 30 mm. Always use the special protective spiral wrap of the delivered fiber jumper on the ONU side.

Earthing

WARNING:

Risk of injury due to disconnected ground.

The installation must have an independent ground connection to an approved earth electrode for indoor applications. Grounding circuit continuity is vital for safe operation of the AnyMedia Optical Network Unit.
The minimum size of protective bonding conductor should be ≥6 mm^2 or ≤AWG 9. For grounding also the ITU recommendation ITU-K.35[a] should be considered. The framework must be correctly connected to the protective earth before the start of work.
Never operate the AnyMedia Optical Network Unit with a disconnected ground.

a Bonding Configurations and Earthing at Remote Electronic Sites

Connecting cables and primary protection/protector blocks

CAUTION:

Destruction of components due to installed cables without protection.

All a/b-cables, ISDN and ADSL cables should not leave the building premises unless connected to telecommunication devices providing primary protection (for example protector blocks) as applicable.

Laser safety

CAUTION:

Injury to eyes caused by invisible laser radiation.

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
Don't look into the end of an exposed fiber or optical connector of a pack as long as the optical source is switched on.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized and ensure that the laser source can not be activated during inspection with the microscope.*
Always observe the laser warning instructions (see page 1-13).

Short circuit and arcing in the batteries area

DANGER:

Destruction of batteries in the event of a short circuit.

A short circuit in the batteries will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete system.
Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Never short out the battery's terminals.
Always verify the polarity before connecting cables to the battery poles when servicing. The keyed 2-pin cable assembly connector of the IR-30EC battery is protected against confusing poles.
You must always use properly insulated tools and test equipment for installing and connecting batteries.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Supply voltage of the ONU Subshelf

CAUTION:

Destruction of components due to a supply voltage of incorrect polarity or a supply voltage which is too high.

The ONU Subshelf operates at a nominal voltage of -48 V DC. The permissible tolerance range is –40.5 V to –57 V DC.
Ensure that the supply voltage has the correct range and polarity before connecting the voltage to the ONU Subshelf. If the ONU is equipped with the power rectifier unit the correct supply voltage is ensured.
Ensure that fuses will be replaced with the same type and rating of fuse.
Never connect the ONU Subshelf to –60 V DC.

Short circuit

CAUTION:

Destruction of packs in the event of a short circuit.

A short circuit in the ONU can cause destruction of electronic components and thus malfunctioning of the complete system.
You must therefore not use objects such as a screwdriver in the pack area.
Never push objects of any kind into this product through slots as they may touch dangerous voltage points or cause a short circuit.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. The wrist strap used must be checked periodically for a resistance between 250 kΩ and 1.5 MΩ to avoid electrostatic discharge.
Therefore before using the wrist strap check the wrist strap for shorts, opens, and proper resistance value. For checking follow local regulations or regulations given by the network provider. Do not use a wrist strap that does not pass these checks.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge.
Hold packs only at the edges or on the insertion and removal facilities.
Always observe the ESD instructions (see page 1-8).

Circuit pack handling

IMPORTANT:

Destruction of components by incorrect handling.

The power should be turned off before inserting or removing a pack circuit pack, unless otherwise specified.
Before replacing a circuit pack, check the identification code to ensure that the proper pack is being used.
Always use the wrist strap.

1.16 Warnings for taking the power supply into operation

Observe the following instructions taking the power supply into operation safely:

Laser safety

WARNING:

Injury to eyes caused by invisible laser radiation.

The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
Don't look into the end of an exposed fiber or optical connector of a pack as long as the optical source is switched on.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized and ensure that the laser source can not be activated during inspection with the microscope.*
Always observe the laser warning instructions (see page 1-13).

High voltage

WARNING:

Dangerous voltage.

The ONU rectifier shelf is fed by AC mains of 110 up to 240 V AC. Touching live parts will shock or cause serious injury or death.
Take care when servicing in this area.
Follow all safety warnings and local regulation practices.

High ringing voltage

WARNING:

Dangerous ringing voltage.

The AnyMedia Optical Network Unit can be fed by ringing voltages of 57 V DC maximum superimposed by 105 V AC maximum. Touching live ringing cables will shock or cause serious injury or death.
Take care when servicing in this area.
Follow all safety warnings and local regulation practices.

Arcing for the internal powered ONU via AC mains

WARNING:

Arcing on removing or inserting a live battery connecting cable or other power cables.

Arcing can destroy the coating of the power connectors.
If service affecting handling is allowed ensure that the battery circuit breaker is switched "OFF" and that the AC mains is switched "OFF" or the AC mains connector is disconnected before disconnecting a battery cable or a power cable.

Cable assembly destruction

WARNING:

Destruction of IR-30EC cable assemblies for improper external charging.

The standard cable assembly mounted to the IR-30EC batteries is designed only for charging currents below 15 A. Charging currents exceeding 18 A will destroy the cable.
If the battery is charged externally the charging current of the external charger must not exceed 18 A under any circumstances if the delivered cable assembly is used.
Do not use boost charger. The battery manufacturer does not allow boost charging without written confirmation.

Short circuit and arcing in the batteries area

DANGER:

Destruction of batteries in the event of a short circuit.

A short circuit in the batteries will cause an arc destruction of batteries and cables and thus malfunctioning of the complete system.
Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Never short out the battery's terminals.
Always verify the polarity before connecting cables to the battery poles in the event of servicing. The keyed 2-pin cable connector of the IR-30EC battery is protected against confusing poles.
You must always use properly insulated tools and test equipment for installing and connecting batteries.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Arcing

WARNING:

Arcing on removing or inserting a live battery connecting cable.

Arcing can cause burns to the hands and damage to the eyes or destroy the coating of the cable connectors.
Ensure that the battery circuit-breaker on the LVD is in the "OFF" position before disconnecting a battery cable.

Supply voltage of the ONU Subshelf

CAUTION:

Destruction of components due to a supply voltage of incorrect polarity or a supply voltage which is too high.

The ONU Subshelf operates at a nominal voltage of -48 V DC. The permissible tolerance range is –40.5 V to –57 V DC.
Ensure that the supply voltage has the correct range and polarity before connecting the voltage to the ONU Subshelf. If the ONU is equipped with the power rectifier unit the correct supply voltage is ensured.
Ensure that fuses will be replaced with the same type and rating of fuse.
Never connect the ONU Subshelf to –60 V DC.

Short circuit

IMPORTANT:

Destruction of packs in the event of a short circuit.

A short circuit in the AnyMedia Optical Network Unit can cause destruction of electronic components and thus malfunctioning of the complete system.
You must therefore not use objects such as a screwdriver in the pack area.
Never push objects of any kind into this product through slots as they may touch dangerous voltage points or cause a short circuit.

Circuit pack handling

IMPORTANT:

Destruction of components by incorrect handling.

The power should be turned off before inserting or removing a pack circuit pack, unless otherwise specified.
Before replacing a circuit pack, check the identification code to ensure that the proper pack is being used.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. The wrist strap used must be checked periodically for a resistance between 250 kΩ and 1.5 MΩ to avoid electrostatic discharge.
Therefore before using the wrist strap check the wrist strap for shorts, opens, and proper resistance value. For checking follow local regulations or regulations given by the network provider. Do not use a wrist strap that does not pass these checks.

Electrostatic discharge (ESD)

IMPORTANT:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge.
Hold packs only at the edges or on the insertion and removal facilities.
Always observe the ESD instructions (see page 1-8).

Condensation

IMPORTANT:

Condensation causes malfunctioning.

Condensation can occur in the AnyMedia Access System, especially during transport on moving from outside to closed rooms; this can cause malfunctioning of the packs.
Ensure that packs and shelves have reached room temperature and are dry before taking them into operation.
Never spill liquid of any kind on the product.

Climatic conditions

IMPORTANT:

Damage to packs under extreme environmental conditions.

Extreme environmental conditions can damage packs and cause malfunctioning.
Ensure that the limits shown in Figure 1-7 according to ETS 300 019-1-3, climatic class 3.2 are complied with during indoor operation.

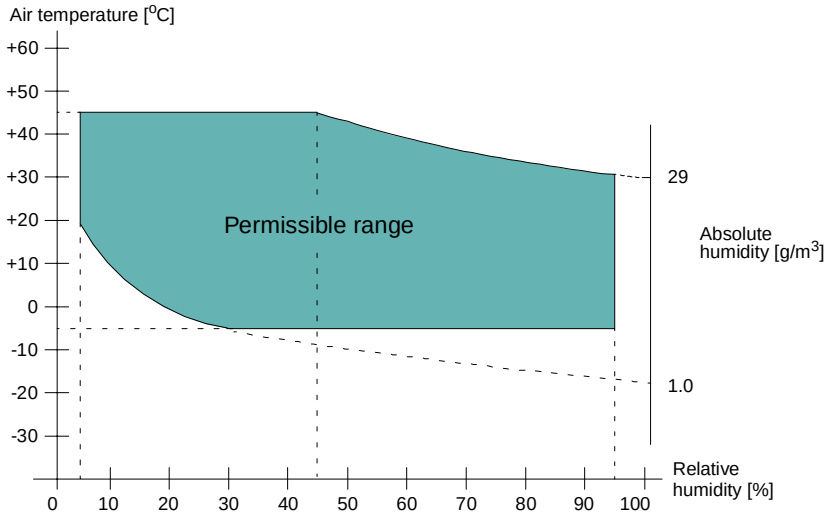

Figure 1-7 Climatogram according to ETS 300 019-1-3, Class 3.2, for indoor operation of the ONU

General ONU information

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General ONU information

2

2.1 General

System features and benefits

The features and benefits of the Lucent Technologies *AnyMedia*® Access System demonstrate the cost-effective, practical, and flexible solution it provides to today's growing telecommunication demands:

- Wide range of supported services from plain old telephony service (POTS) up to ADSL-broadband services
- Competitively priced telephony deployment for first installations and for later network extensions in the event of increasing needs for additional lines
- Service-independent access solution by means of a common platform for all services
- Architectural flexibility by a modular structure (*AnyMedia* Mainshelf and ONU)
- The *AnyMedia* Access System supports up to eight remote optical network units (ONUs)
- Simplified operations for system turn-up and upgrades

ONU features

Special features of the ONU are:

- Very compact size, (876 mm (h) × 437 mm (w) × 345 mm (d))
- Wall-mounting for indoor applications
- Precabled for ease of installation
- Internal cooling by a fan unit
- Powering by AC mains and buffering for 5 hours by batteries
- Internal ringing generator
- Support of up to 96 narrowband timeslots and full broadband capacity.

ONU main components

The ONU is designed for indoor applications. It is wall-mounted and includes all internal cabling. The following components are used or can be used in the ONU:

- The ONU housing for wall-mounting with all internal cabling
- The ONU Subshelf for inserting the optical controller pack (OCP), the 8 application packs (APs) and the ringing generator unit (RGU)
- The rectifier shelf, for inserting the power rectifier unit (PRU) and the low voltage disconnect unit (LVD), with the rectifier backplane and connectors
- The 7A fan unit
- The four IR-30EC batteries in the battery compartment.

The following figure shows a front view of an equipped ONU.

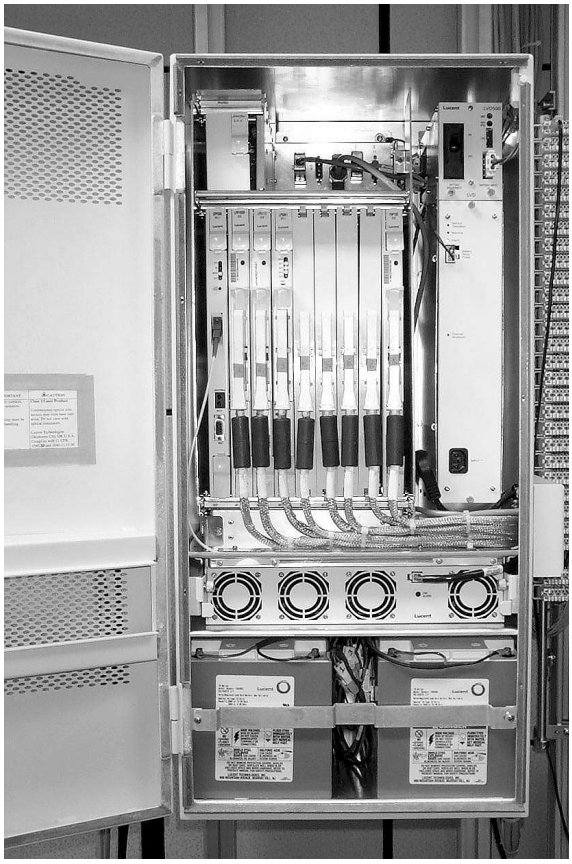


Figure 2-1 Front view of an equipped ONU

2.1.1 Functional description

A short functional description of the ONU is given below.

Overview

Besides *AnyMedia* Mainshelf applications the *AnyMedia* Access System also supports access via an optical network unit (ONU). *AnyMedia* Mainshelf and ONU are connected via the optical link, an optical point-to-point connection, with a transmission rate of 155 Mbit/s (see Figure 2-2, page 2-4).

The optical link is a single fiber link (with wave division multiplexing (WDM)) with a reach of up to 15 km and compliant to a SONET OC-3 link. The OC-3 signal is the electrical-to-optical converted STS-3c signal which is called STM-1 in SDH standards. All information transported in the optical link is mapped into ATM cells.

Optical link, OAP and OCP

For connecting an ONU via an optical link an optical application pack (OAP) has to be installed in the *AnyMedia* Mainshelf. One OAP supports one optical link. In narrowband-only applications up to eight ONUs can be connected to one *AnyMedia* Mainshelf. If broadband services are also supported up to seven ONUs can be connected.

The ONU has to be equipped with one optical controller pack (OCP) providing the interface to the *AnyMedia* Mainshelf. Moreover, the ONU can house up to 8 APs (narrowband and/or broadband packs).

The ONU is designed for mounting on a wall. It can be equipped with the same type of application packs (APs) as the *AnyMedia* Mainshelf and thus it is able to provide the same types of services that the larger *AnyMedia* Mainshelf provides.

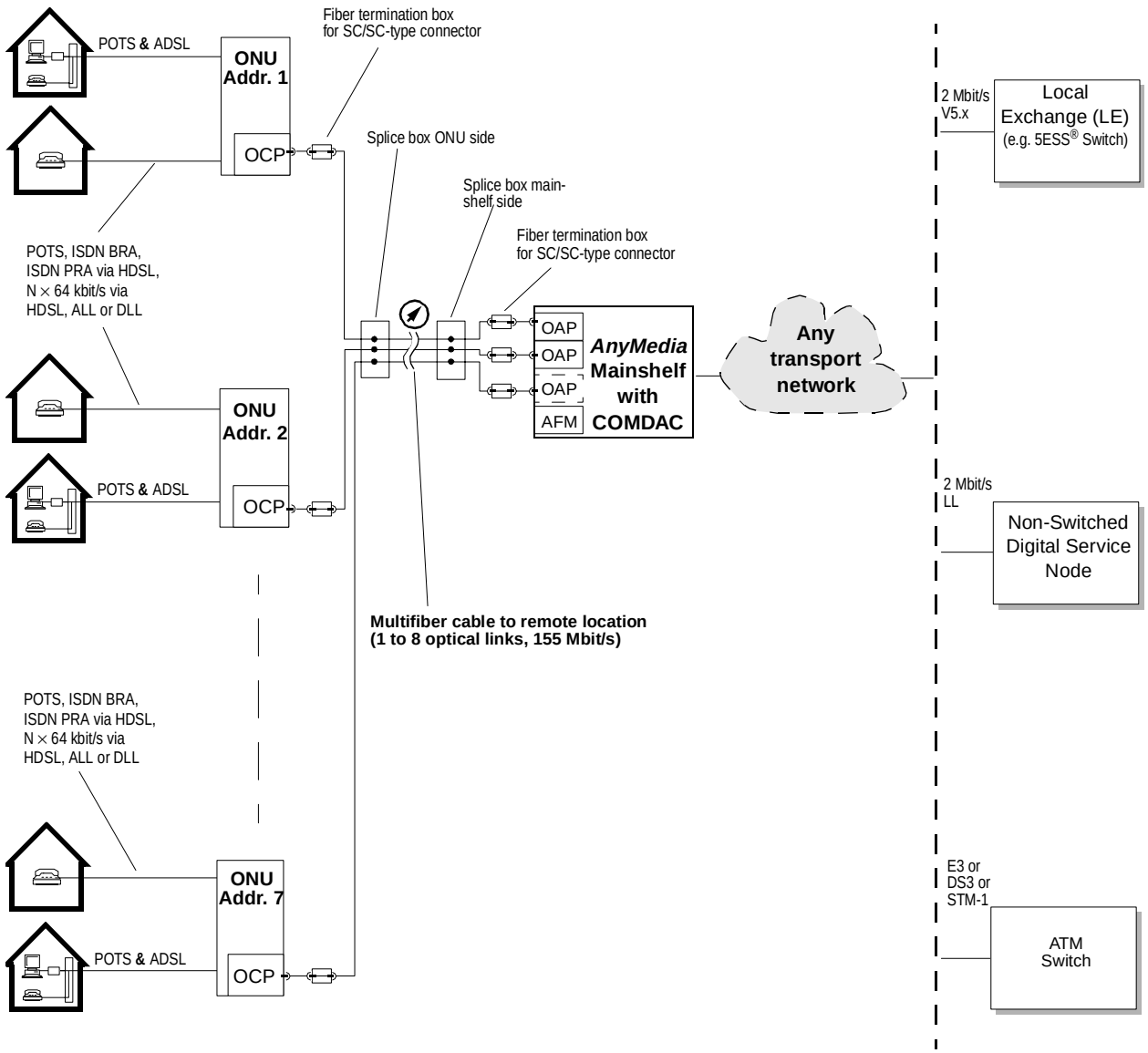

POTS & ADSL
ONU Addr. 1
OCP
Fiber termination box for SC/SC-type connector
Splice box ONU side
Splice box main-shelf side
Fiber termination box for SC/SC-type connector
POTS, ISDN BRA, ISDN PRA via HDSL, N × 64 kbit/s via HDSL, ALL or DLL
OAP
OAP
OAP
AFM
AnyMedia Mainshelf with COMDAC
Any transport network
2 Mbit/s V5.x
Local Exchange (LE) (e.g. 5ESS® Switch)
ONU Addr. 2
POTS & ADSL
OCP
2 Mbit/s LL
Non-Switched Digital Service Node
Multifiber cable to remote location (1 to 8 optical links, 155 Mbit/s)
POTS, ISDN BRA, ISDN PRA via HDSL, N × 64 kbit/s via HDSL, ALL or DLL
ONU Addr. 7
POTS & ADSL
OCP
E3 or DS3 or STM-1
ATM Switch

Figure 2-2 Example of applications with the ONU

2.1.2 Interfaces of the optical network unit (ONU)

Service interfaces The service interfaces to the subscriber side are located on the APs and therefore identical for the *AnyMedia* Mainshelf and the ONU.

Synchronization interface The ONU does not require any synchronization interface because the clock for the narrowband signal is recovered from the optical link.

OAM&P interfaces

The remote maintenance connection interface (RMC) is used for the OAM&P interface.

The RMC interface includes an RS-232C connector on the faceplate of the OCP. The RMC is a restricted-feature remote CIT interface of the *AnyMedia* Mainshelf.

For GSI operations the optical link has to be operational.

Alarm closure inputs

The ONU Subshelf provides eight ground closure alarm inputs to indicate environmental fault conditions. For the wall-mounted ONU seven alarm inputs TLM1 to TLM7 are factory crossconnected from the backplane of the rectifier shelf. TLM8 is not used. The meaning of the alarming inputs cannot be changed by the customer, for alarming concept, see Chapter 2.1.5, page 2-15.

Testing interfaces

The OCP provides the same CHAN/MON DROP connector for manual testing as the CIU in the *AnyMedia* Mainshelf.

Configuration options

The ONU is designed for mounting on a wall. It can be equipped with the same type of application packs (APs) as the *AnyMedia* Mainshelf and thus it is able to provide the same types of services that the larger *AnyMedia* Mainshelf provides.

The ONU can be configured as narrowband-only shelf, broadband-only shelf or as a mix of both. In every configuration a COMDAC has to be installed in the *AnyMedia* Mainshelf.

APs for NB services

The following APs can be used for narrowband services:

- The LPZ100C provides up to 32 Z ports
- The LPP100B provides up to 24 Z ports
- The LPZ120B/121B/122B provide up to 32 Z ports (without TAP feature)
- The LPU112 provides up to 12 U ports
- The LPU430 provides up to 16 U ports
- The LPS501/LPS503/LPS504 provide 2 $\times$ 2 HDSL ports (for 1168 kbit/s each)
- The LPS510 provides 8 duplex SHDSL ports (and 4 duplex E1 ports which are not used for the ONU)
- Optionally one test application pack TAP100 for integrated test and measurement[1].

APs for BB services

The following APs can be used for broadband services:

- The LPA400B provides up to 4 ADSL ports to which 4 Z ports can be combined via 4 internal splitters.
- The LPA408 (ADSL8p AP) provides 8 ADSL ports to which 8 Z ports can be combined via 8 on-board splitters

1 The test path routes to the Equipment side (towards the subscriber/customer) and to the Facility side (towards the local exchange).

- The LPA414 (ADSL4i AP) provides 4 ADSL to which 4 ISDN ports (with 2B1Q/4B3T) can be combined via 4 on-board splitters
- The LPA416/LPA419 (ADSL16p AP) provide 16 ADSL ports to which 16 Z ports can be combined via 16 on-board splitters
- The LPA417 (ADSL16i AP) provide 16 ADSL ports to which 16 ISDN ports (with 2B1Q/4B3T) can be combined via 16 on-board splitters
- The LPS716 provides 16 SDSL ports.

Capacity for NB The transport capacity for narrowband subscriber channels is 96 timeslots. A timeslot corresponds to the transport capacity of one bearer channel resulting in, for example, 96 POTS or 48 ISDN BRA subscribers, supported per ONU.

Capacity for BB Additional the full transport capacity of the broadband feeder (E3 or DS3) is available in the ONU.

2.1.3 Earthing/grounding, powering and ringing

Powering For powering of the ONU the internal power rectifier unit (PRU) is used, which delivers the –48 V DC voltage. The PRU is fed by the customer's AC mains.

For buffering a non-outgassing, carefree back-up battery of valve-regulated lead-acid type is required (VRLA type). For the ONU, IR-30EC batteries from Tyco are used. The batteries are mounted inside the ONU housing. The batteries are connected to the PRU via a low voltage disconnect unit (LVD).

2.1.3.1 Earthing/grounding

Grounding Environment The *AnyMedia* optical network unit is designed to work in mesh-BN[1] or mesh-IBN[2] environments according to ETS 300 253.

Earthing For earthing the ONU housing is equipped with an M6 grounding stud on the right side of the ONU under the cable access cover.

The earthing connection required for each ONU housing serves several purposes:

- A direct earth ground connection for lightning protection in common bonding networks.
- A common ground potential for electrostatic discharge (ESD) protection.
- A safety ground.

All ground connections must have a very low impedance for effective conduction of interference currents and for avoiding EMC interferences.

1 Meshed bonding network

2 Meshed isolated bonding network

The ONU metalwork must always be connected permanently to the approved earth electrode via the independent green wire/grounding connection.

WARNING: **Risk of injury due to disconnected ground.**

The installation must have an independent ground connection to an approved earth electrode for indoor applications. Grounding circuit continuity is vital for safe operation of the AnyMedia optical network unit.
The minimum size of the independent ground connection should be ≥6 mm^2 or ≤AWG 9.
The framework must be correctly connected to the protective earth before the start of work.
Never operate the AnyMedia optical network unit with a disconnected ground.

The following figure shows the connecting principle for powering, ringing and earthing.

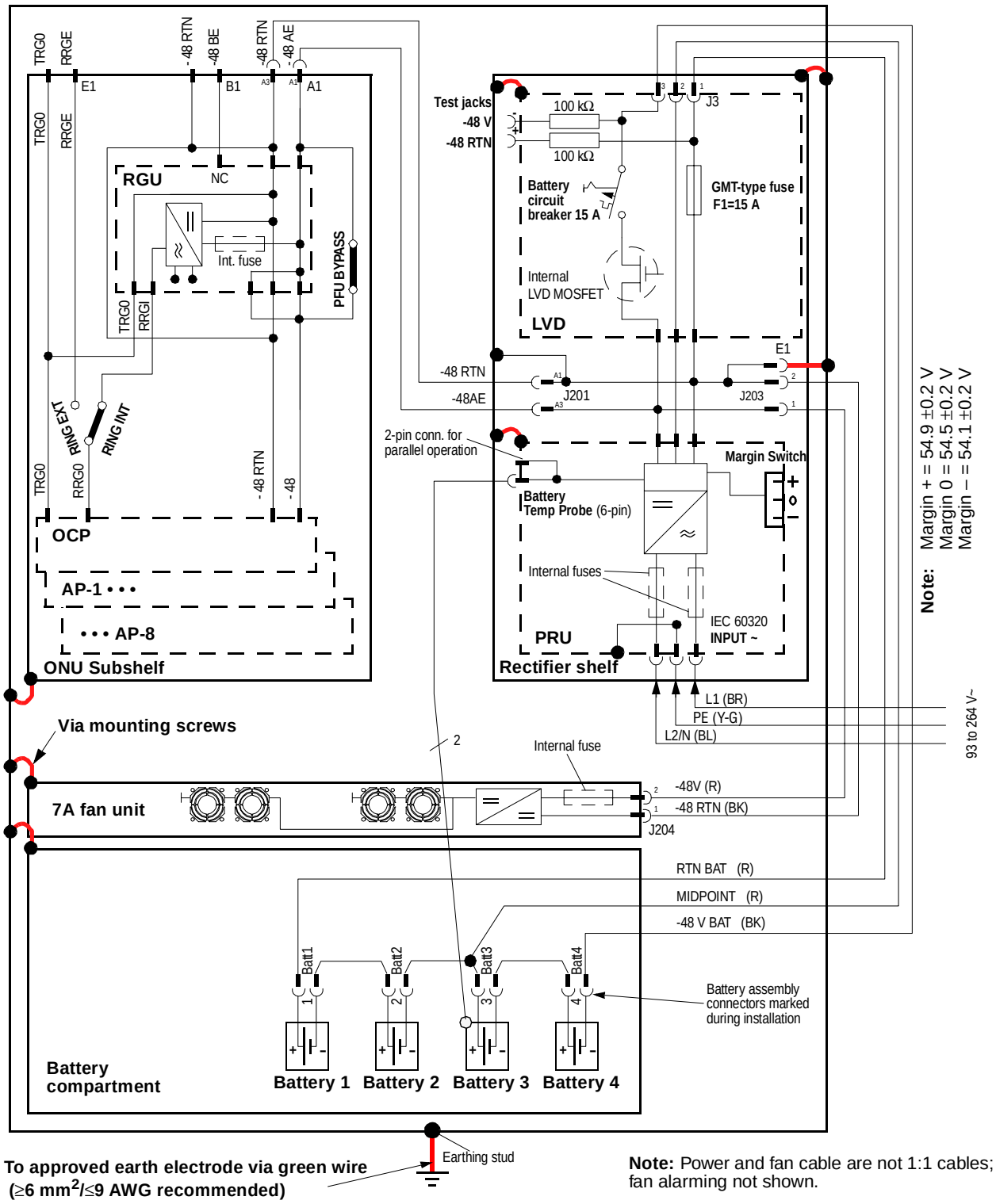


Figure 2-3 Principle of ONU powering, earthing and ringing

Internal ground connections

The ONU Subshelf backplane and the rectifier shelf backplane support two ground signals:

- **-48RTN** **Common** analog/digital ground signal and return path for both -48 V power feeders (-48A and -48B).
- **FRMGND** Frameground.

The ONU Subshelf has a common ground signal used by all packs for analog and digital ground (–48RTN) which is in common with the -48V return path. Inside the ONU Subshelf the -48RTN and FRMGND are not connected internally.

All the ONU Subshelf metalwork is connected to the ONU housing metalwork (potential frameground FRMGND) via the mounting screws, no additional green wire is necessary.

On the backplane of the rectifier shelf the -48RTN and the FRMGND are connected internally.

All rectifier shelf metalwork is connected to the ONU housing metalwork (potential frameground FRMGND) via the mounting screws, no additional green wire is necessary.

In accordance with working in mesh-BN or mesh-IBN environments the common ground signal (–48RTN) and the metalwork (FRMGRND) are connected together directly at one point inside the ONU. Additionally an interconnection green wire connects the rectifier backplane RTN/FRMGND potential to the metalwork of the ONU housing.

The protective earth wire (PE) of the IEC 60320 AC power inlet receptacle is connected to the metalwork (FRMGND) inside the power rectifier unit (PRU).

NOTE:
For the first deliveries there are rectifiers with an IEC 320 AC inlet. These rectifiers require a power cord with the appropriate IEC 320 plug.

All internal connector housings are connected to FRMGND via the mounting screws.

Return paths for internal powering and ringing

The standard ONU delivery variant for indoor applications is equipped with the power rectifier unit (PRU) for -48 V and with the low voltage disconnect unit (LVD) in the rectifier shelf and with the ringing generator unit (RGU) in the ONU Subshelf.

On the backplane of the rectifier shelf the -48 V return path (-48RTN) is connected to FRMGND which is connected to the PE of the AC mains inlet. An additional green wire is used for interconnection between -48RTN and FRMGND. The wire is connected from the backplane of the rectifier shelf, blade terminal E1, to a separate earthing stud on the upper right side of the ONU housing.

The ringing return path (TRG0) is invisibly connected to the -48 V return path (-48RTN) inside the ringing generator.

2.1.3.2 Powering

The ONU for indoor applications is designed for powering via AC mains (local powering).

Rectifier shelf

The ONU for indoor applications is configured with an internal rectifier shelf designed for the power rectifier unit (PRU) and the low voltage disconnect unit (LVD). They are delivered separately.

From the rectifier backplane power cables are routed to the ONU Subshelf and to the fan unit. Also the door switch is connected via the backplane.

Power rectifier unit (PRU

Rectifier

The power rectifier unit (PRU) is fed by AC mains via an IEC 60320 AC mains power inlet. The PRU is buffered via 4 IR-30EC batteries which are connected to the PRU via the internal low voltage disconnect unit (LVD).

NOTE:
For the first deliveries there are rectifiers with an IEC 320 AC inlet. These rectifiers require a power cord with the appropriate IEC 320 plug (for example the power cord 84847118).

Table 2-1 Input specification of the PRU

Parameter	Value
Input voltage range	93 to 264 V AC (nominal 120/240 V AC)
Input frequency range	47 to 63 Hz
Inrush current	Compliant with ETS 300 132-1
EMC	Compliant with EN55022, Class B
Input harmonics	Compliant with EN61000-3-2 A2:1998

The rectifier is designed for 540 W at maximum. The rectifier has a constant voltage characteristic up to an output current of 10 A, followed by a constant power characteristic down to -40.5 V (13 A) and followed by a constant, limited current characteristic down to approximately -26 V; for characteristic see Figure 2-4, page 2-11.

NOTE:
The 540 W power rectifier unit for the indoor ONU is situated for operating in over voltage category 2 (according to IEC 60664-1) locations. Mains transients may never cross 2.5 kV. Additional surge arrestors may be required depending on the site conditions.

Table 2-2 Output specification of the PRU

Parameter	Value
Output voltage with battery temperature sensing probe	-54.5 V ±0.2 V at 25°C (Margin switch set to middle position "0")
Output voltage without battery temperature sensing probe	Approx. -52.5 V ±0.2 V
Output power	Constant voltage characteristic up to an output current of 10 A (540 W) Constant power characteristic down to -40.5 V (13 A) Constant (limited) current characteristic down to -26 V
Load current sharing	Parallel or n+1 redundant operation with active load sharing
Ripple and noise	Less than 75 mV_{rms} (or 200 mV_{p-p} (DC to 20 MHz)) when connected to a 48-V battery string of 36 mΩ nominal impedance
Overvoltage protection	Output will not exceed -63 V

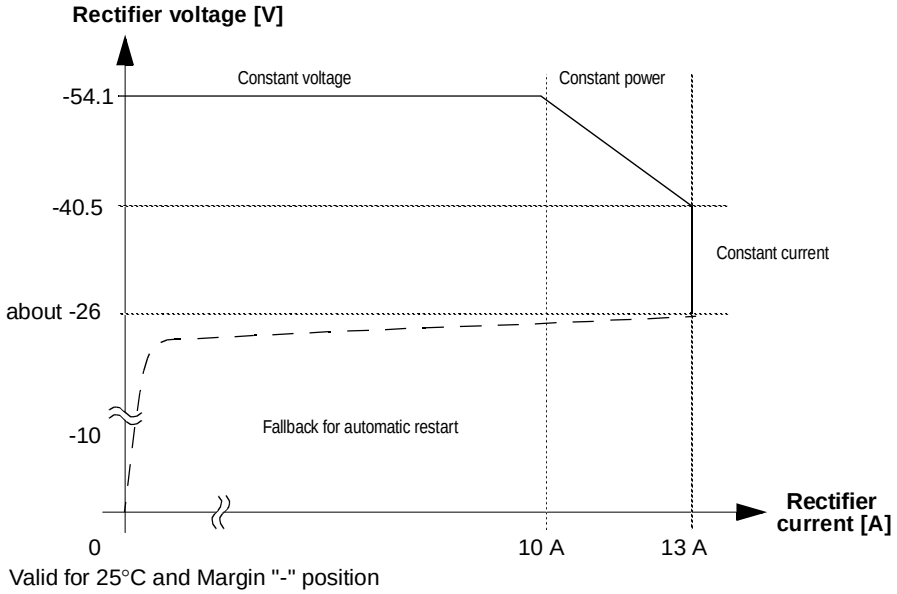


Figure 2-4 Rectifier voltage operation characteristic (typical)

The rectifier voltage can be adjusted via a 3-position Margin switch to -54.5 V ±0.4 V, see table below.

Adapting the voltage

This 3-position switch adapts the charging voltage for different battery types. The following adjustments are possible.

Table 2-3 Charging adjustments for the PRU via Margin switch at 25°C

Margin switch position	Charging voltage [V][a]	Recommended battery type
MARG position "+"	-54.9 ±0.2 V	-
MARG position "0"[b]	-54.5 ±0.2 V[b]	-
MARG position "-"	-54.1 ±0.2 V	IR-30EC

a The voltage is valid for 25°C and with the thermal probe connected into the PRU. If the thermal probe is not connected the voltage is fixed in the rectifier to -52.5 V.

b Factory setting as it is delivered.

The Margin switch is located on the top of the PRU. The adjustments have to be done before the PRU is inserted.

NOTE:
If the delivered thermal probe (10 kΩ at 25°C) is disconnected the rectifier output voltage is reduced to approx. -52.5 V ±0.4 V.

In the ambient temperature range -5°C to +53°C the voltage is compensated for battery charging at a compensation rate of -72 mV/°C up to approx. -57 V at maximum and to approx. -52.5 V at minimum; for compensation see Figure 2-5, page 2-13.

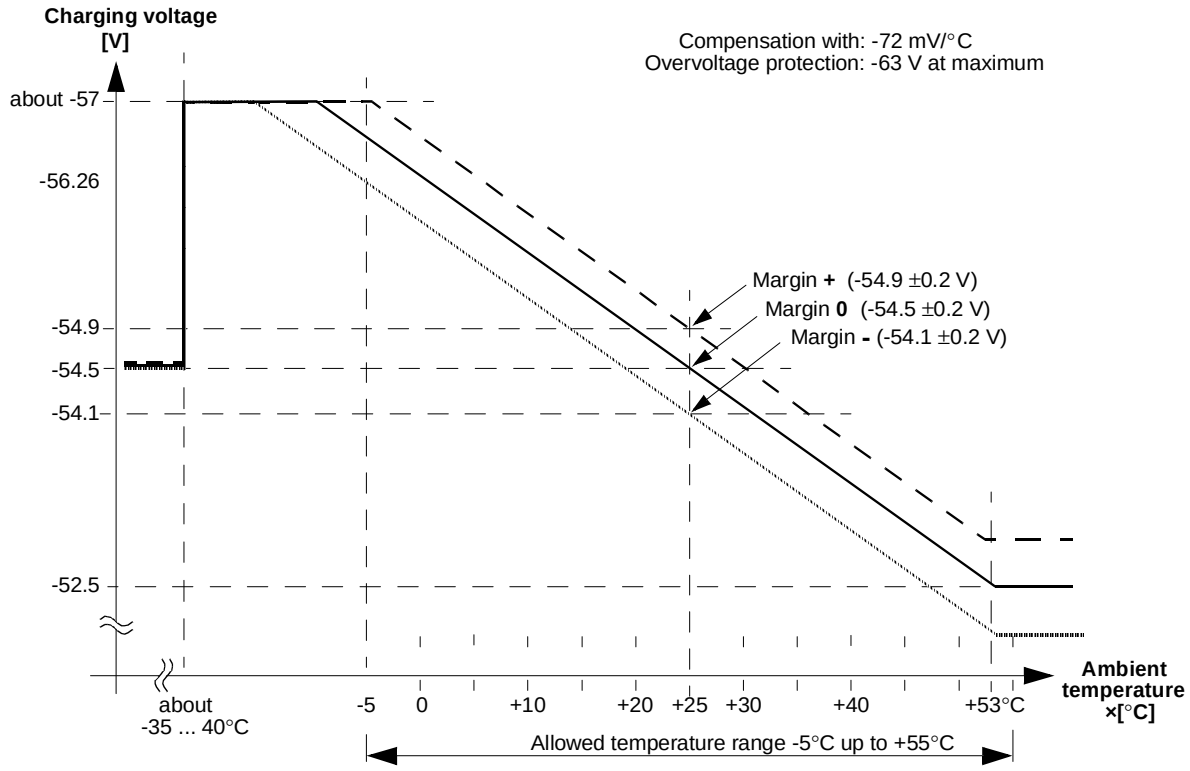


Figure 2-5 Temperature compensation of charging voltage (typical)

Low voltage disconnect unit (LVD)

Low voltage disconnect

The low voltage disconnect unit (LVD) is designed for connecting the 4 IR-30EC batteries to the PRU. The LVD is equipped with an automatic battery disconnect feature which disconnects the batteries automatically from the load at approximately -42 ±0.5 V and as long as the voltage is below -48 ±1 V (hysteresis).

NOTE:
The LVD connects the battery to the load if the battery voltage has reached approx. -48 V. When the LVD disconnects the batteries from the load, the batteries will still be charged in the meantime by the PRU - if the PRU is working.

In the case of a short the battery circuit breaker will trip if the current exceeds the nominal value (15 A). The circuit breaker is of the single-pole type, the -48V path is protected.

Additionally a front accessible GMT-type fuse (15 A) is used for protecting the -48RTN path.

Test terminals for -48 V

The LVD is equipped with test terminals for the -48 V. These terminals are connected directly between the batteries and the battery fuse/circuit breaker, see also Figure 2-3, page 2-8.

The rectifier output voltage measured at these terminals will be decreased by a voltage drop caused by the internal protection resistors and the internal resistance of the rectifier equipment. The voltage drop depends on the input resistance of the multimeter used.

At the moment the LVDs are equipped with two protection resistors of 100 kΩ. Therefore the voltage drop is approx. 1 V if the standard multimeters are used.

2.1.3.3 Ringing

The ONU for indoor applications is designed for internal ringing via the ringing generator unit (RGU).

Ringing generator unit

The ringing generator unit is inserted into the ONU Subshelf where for other, future applications the power filter unit (PFU) can be inserted alternatively.

The ringing generator output is 86 V_{rms} superimposed due to the DC supply voltage of the PRU.

The ringing frequency is adjustable via two jumpers to: 17, 20, 25, 50 Hz. The factory installed frequency is 25 Hz, for adjusting see Figure 4-31, page 4-39.

The ring return path (TRG0) is invisibly connected to the -48 return path (-48RTN) inside the RGU. If the RGU is removed this connection does not exist anymore.

2.1.4 Environmental conditions

The *AnyMedia* optical network unit is designed to meet the appropriate regulations of European Telecommunication Standard ETS 300 019-1 (Environmental conditions and environmental tests for telecommunications equipment).

Indoor operation

For indoor operation the *AnyMedia* optical network unit fulfills the conditions of environmental class 3.2 (stationary use at weatherprotected locations, partly temperature-controlled) of ETS 300 019-1-3; for climatogram see Figure 1-7, page 1-35.

Transport

For transport the *AnyMedia* optical network unit fulfills the conditions of environmental class 2.3 (public transportation) of ETS 300 019-1-2; for climatogram see Figure 1-5, page 1-25.

Storage

For storage the *AnyMedia* optical network unit fulfills the conditions of environmental class 1.2 (weatherprotected, not temperature-controlled storage locations) of ETS 300 019-1-1; for climatogram see Figure 1-6, page 1-25.

Thermal voltage compensation for charging

The thermal management system of the used power rectifier unit (PRU) is designed to poll the battery thermal probes for the worst-case battery temperature

and provides an indication to the control unit to lower the plant voltage if any temperature threshold is exceeded.

NOTE:
The internal temperature compensation of the charging voltage is done by the PRU for ambient temperatures in the range -5°C to +53°C. The compensation rate of the PRU is -72 mV/°C; for compensation see Figure 2-5, page 2-13.

Cold start The lowest cold-start temperature is -40°C.

2.1.5 Alarming concept for environmental alarms

Alarm input conditions All 8 alarm inputs of the ONU Subshelf are ground closures (via connector D1, ALARM). For the wall-mounted ONU the alarm inputs TLM1 to TLM7 are factory crossconnected as described in the table below from the backplane of the rectifier shelf. TLM8 is not used. The meaning of the alarming inputs cannot be changed by the customer.

The alarms on the rectifier backplane are not fuse protected and therefore not protected against overcurrent or overvoltages.

Failure and optical link Errors and environmental ONU alarms in the ONU are logically routed by the OCP via the optical link to the *AnyMedia* Mainshelf where the alarms are monitored and recognized by the COMDAC. Only the COMDAC can turn on the FAULT LED on the OCP - provided that the optical link works properly.

NOTE:
To check that the communication between the ONU Subshelf and the *AnyMedia* Mainshelf via the optical link works properly the LED TEST button on the OCP can be used. All LEDs on the OCP faceplate and on all APs light for approximately 10 seconds; then the LEDs return to their previous status.

Monitoring interval The monitoring of the ONU alarms is performed by the OCP software and each state change is detected by the COMDAC in the *AnyMedia* Mainshelf. To avoid the reporting of short contact closures the closure must be closed (potential -48RTN) for at least 5 seconds. The same period is valid for the failure clearance.

NOTE:
Packs in the ONU Subshelf support the same alarm conditions and severities as defined in the *AnyMedia* Mainshelf.

Alarm clearance All raised environmental alarms are cleared by the COMDAC if the optical link connection is lost and the COMDAC cannot monitor the ONU. The alarms are reraised after successful reestablishment of the optical link if the failure persists.

Alarm provisioning

In the *AnyMedia* Mainshelf all the ONU TLM alarm inputs are provisionable for the alarm severities Major (MJ), Minor (MN) and Critical (CR). All used ONU TLM alarm inputs **must** be provisioned during turn-up per ONU; for recommended settings for the ONU, see Table 2-4, page 2-17.

NOTE:
All alarm outputs in the *AnyMedia* Mainshelf are provisionable via the SET-ATTR-AIO command.The **default TL1 settings** are REL1 for MN, REL2 for MJ and REL3 for CR. Be careful when you change the above settings; e.g. if REL3 is set to MN only, a critical alarm will no longer be reported via the alarm contacts.

AP alarming

The APs in the ONU are monitored by the COMDAC in the *AnyMedia* Mainshelf by periodic polling messages. If the AP does not respond to the polling message the AP will be recognized as faulty.

OCP alarming

The OCP is not monitored by periodic polling messages but monitored via a special keep-alive protocol performed between the OAP in the *AnyMedia* Mainshelf and the OCP in the ONU Subshelf. If the OAP detects a failure of the keep-alive protocol this failure will be reported and alarmed as a failed ONU. The alarm severity used is CR.

Alarms for battery, fan and rectifier

The following table shows for the wall-mounted ONU which alarms are generated and to which alarm inputs of the ONU Subshelf they are routed.

Table 2-4 Example of using alarms from the *AnyMedia* optical network unit

Recommended predefined ALMTYPE; environmental fault ONU [a]	Possible failure causes	ONU alarm input (connector D1)	Recommended *AnyMedia* alarm severity [b]	ONU Subshelf AID setting [b]
(Use one of MISC1 to MISC8)	BCF: Battery cell failure ■ Balance failure due to a short of a single battery cell	TLM1	MN	submc-{1...8}-{1} [c]
(Use one of MISC1 to MISC8)	PRF: Power rectifier failure ■ Rectifier failed due to hardware problems ■ Undervoltage (<-26 V) or overload [d] (>13 A) ■ Power rectifier unit in standby mode due to thermal problems in the rectifier	TLM2	MJ	submc-{1...8}-{2}
ACF	AC mains failure ■ External main fuse blown or external AC mains circuit breaker tripped or open ■ AC mains disconnected ■ At least one of the internal fuses inside the rectifier is blown (not replaceable by customer) ■ Loss of AC mains [e] ■ Undervoltage (<80 V)	TLM3	MJ	submc-{1...8}-{3}
BD	Battery on discharge ■ AC mains failure (ACF) has not been repaired - ONU will shut down in a short time!	TLM4	CR	submc-{1...8}-{4}

Table 2-4 Example of using alarms from the *AnyMedia* optical network unit –*Continued*

Recommended predefined ALMTYPE; environmental fault ONU [a]	Possible failure causes	ONU alarm input (connector D1)	Recommended *AnyMedia* alarm severity [b]	ONU Subshelf AID setting [b]
FAN	7A fan unit failure ■ At least one internal fan is defective ■ Internal DC/DC converter failed ■ Internal fuse inside the fan unit blown	TLM5	MN	submc-{1...8}-{5}
TAMPER	TAMPER/INTRUSION ■ ONU door open	TLM6	MN	submc-{1...8}-{6}
MJF	Major fuse alarm (monitoring) ■ Battery circuit breaker on the LVD open or tripped ■ Blown output GMT-type fuse F1 (15 A) on the LVD	TLM7	MN	submc-{1...8}-{7}
NONE [f]	Contact not provisioned (provided for future use: monitoring fuse/circuit breaker for AC mains, alarm severity CR)	TLM8	MN	submc-{1...8}-{8}

a For the wall-mounted ONU the alarm inputs TLM1 to TLM7 are factory crossconnected on the rectifier shelf backplane as described in the table.

b All TLM inputs are provisionable for alarm severities Major (MJ), Minor (MN) and Critical (CR), all alarm types (ALMTYPE) and alarm messages (ALMMSG) for the AIDs submc-{1..8}-{1...8} corresponding to the alarm inputs TLM1 to TLM8 **must** be provisioned by the operator via the PC GSI ("Fault Management", command SET-ATTR-ENV). For provisioning the alarm messages to the AIDs subm-{1}-{1...8} the operator can assign the predefined ALMTYPE (e.g. BD or MJF) using the predefined unchangeable alarm messages or the operator must create a new alarm message in the ALM Message input line using the ALMTYPE *MISC1* to *MISC8*.

c Note for setting: submc-{1...8}-{1..8} where the first {} is the ONU Subshelf number, the second {} is the alarm input number corresponding to TLM1 to TLM8.

d Red Alarm LED on the power rectifier unit flashes.

e Consider the alarm monitoring interval of 5 seconds.

f NONE is used for a not provisioned alarm input, the alarm severity is MN for the ALMTYPE NONE.

2.2 ONU configuration

The following chapters briefly describe the ONU configuration and the main parts of the wall-mounted ONU for indoor applications.

2.2.1 Overview

Housing configuration

The following housing configuration is available:

- Wall-mounted optical network unit (ONU) for indoor applications for remote access to the *AnyMedia* Mainshelf via an optical point-to-point single-fiber connection (optical link).

2.2.2 Main components of the ONU

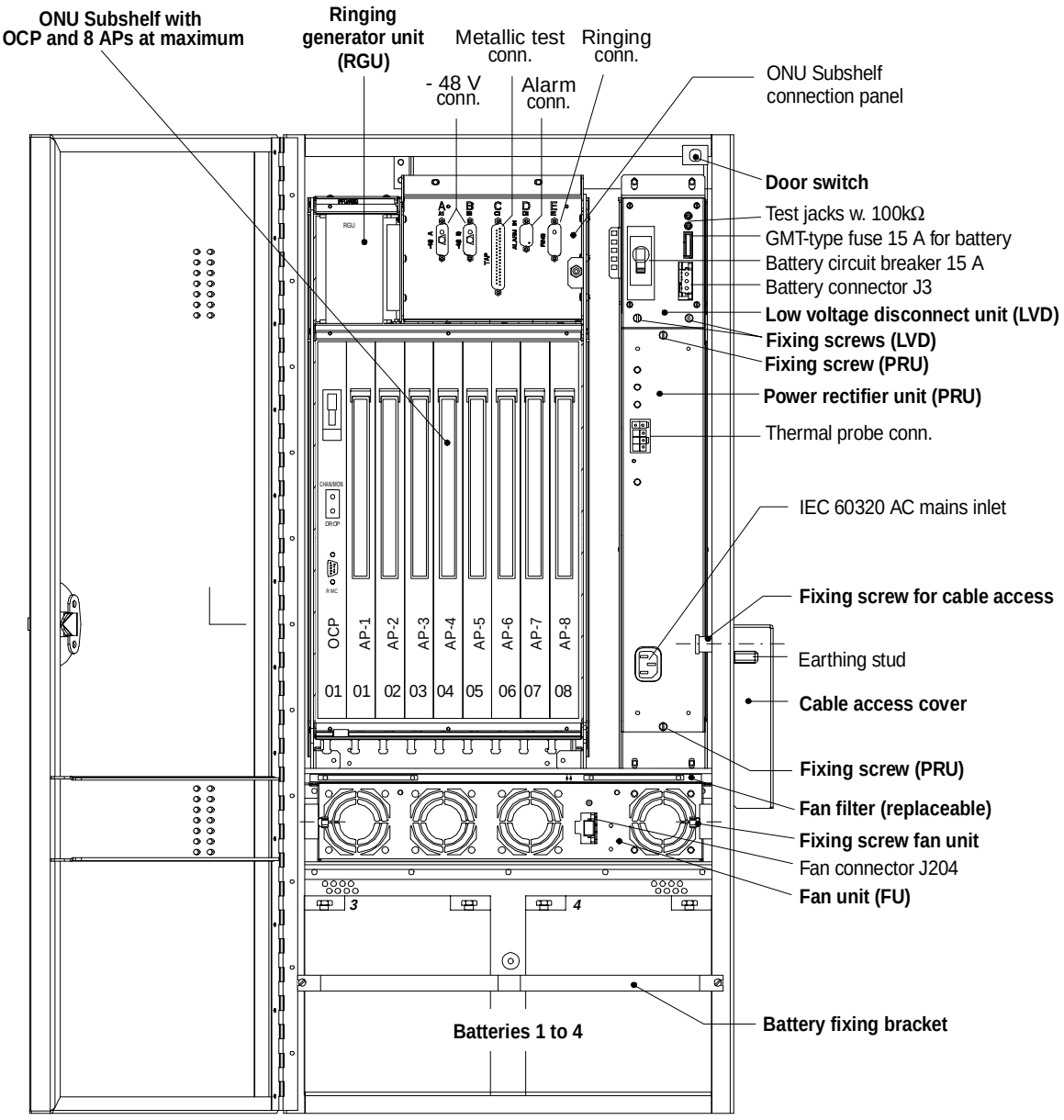
ONU main components

The following components are used or can be used in the ONU:

- The ONU housing for wall-mounting with all internal cabling
- The ONU Subshelf for inserting:
  - — the optical controller pack OCP
  - — the 8 APs at maximum for narrowband and broadband services
  - — the ringing generator unit (RGU)
- The rectifier shelf with the rectifier backplane and connectors, for inserting:
  - — the power rectifier unit (PRU) 540 W at maximum
  - — the low voltage disconnect unit (LVD) with the battery circuit breaker and with the GMT-type battery fuse
- The 7A fan unit
- The four IR-30EC batteries in the battery compartment.

For wall mounting the ONU should be mounted about 900 up to 1200 mm above the ground to ease installation and maintenance.

The following figure shows the main parts of the fully equipped ONU. For the ONU in the delivery state see also Figure 5-1, page 5-7.



AP = Application pack
conn. = Connector
OCP = Optical controller pack

Note: Cabling not shown, for all cables see Figure 6-4, page 6-7

Figure 2-6 ONU with batteries, LVD, PRU, RGU and a fully equipped ONU Subshelf

2.3 ONU arrangement

In this chapter the main components of the ONU for indoor applications will be described.

2.3.1 Arrangements for the ONU housing

The main parts of the ONU can be found in Figure 2-6, page 2-20.

2.3.1.1 Earthing studs

The approved earth electrode must be connected by the installer to the M6 earthing stud. The earthing stud is located under the cable access cover on the right side of the ONU housing.

For the earthing, grounding and ESD points of the ONU see Figure 4-2, page 4-7.

2.3.1.2 Door switch

The door switch is located on the upper right side of the ONU housing, Figure 2-6, page 2-20.

The door switch is factory cabled to issue an alarm if the door is open.

The alarm meaning can be changed by connecting the wire of the middle door switch contact to the upper door switch contact instead (the alarm is issued if the door is closed).

2.3.2 Arrangement of the ONU Subshelf

Features

The ONU Subshelf consists of a metal mechanical structure that serves to guide and fasten packs, locate and mount a multi-layer backplane, allows mounting into supporting structures such as the ONU and provides an interface for internal and external connections.

Arrangement of ONU Subshelf

The ONU Subshelf is arranged to accommodate one 1N[1] pack in the upper row of slots and nine 3N[1] packs in the lower row of slots. The figure below shows the ONU Subshelf arrangement when the ONU Subshelf is fully equipped.

1 1N is 96 mm high, 3N is 336 mm high (Lucent Technologies One NS Hardware Standard).

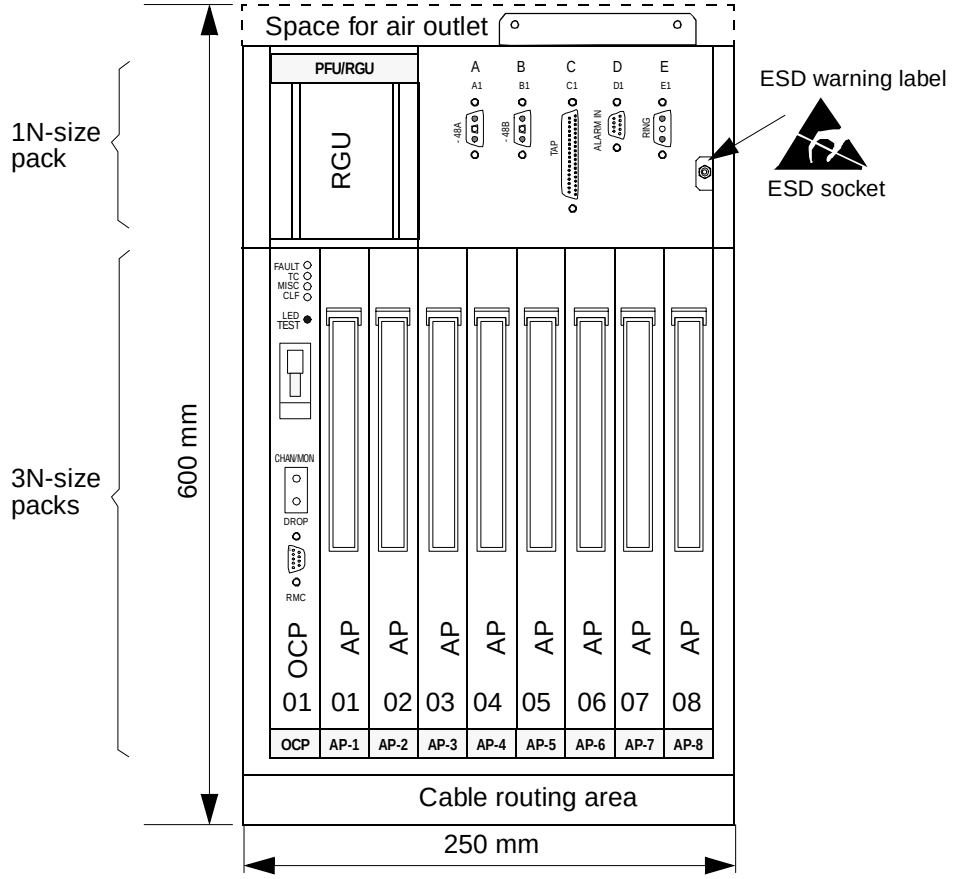


Figure 2-7 Pack arrangement and connector arrangement of the ONU Subshelf

On the right side of the upper row the ONU Subshelf connection panel (SCP) is located. The cables plug into the connectors which are accessible at the SCP and route horizontally to the right side of the ONU Subshelf.

A cable routing area is located at the bottom of the ONU Subshelf. The a/b cables plug into the faceplate connectors of the application packs and route vertically down to the cable routing area and horizontally to the right side of the ONU Subshelf.

For the cabling arrangement see also Figure 2-15, page 2-36.

2.3.2.1 Connector arrangement for the ONU Subshelf connection panel

The figure below shows the connector arrangement of the ONU Subshelf Connection Panel.

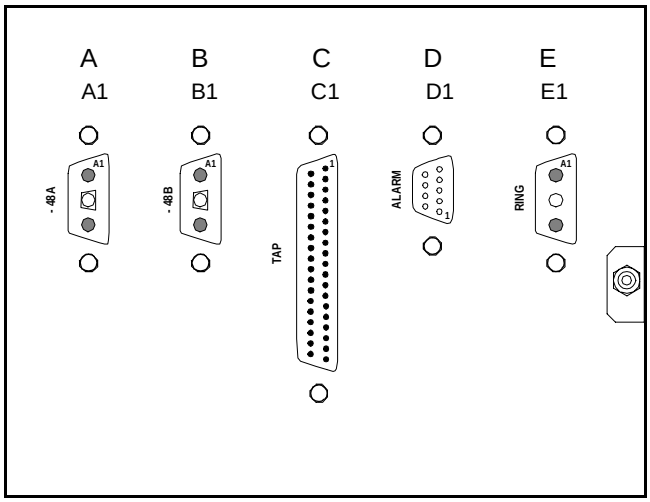


Figure 2-8 Connector arrangement of the ONU Subshelf connection panel

Powering

For the delivered standard application the 2nd -48V power connector B1 is not used.

The ONU Subshelf is powered by the power rectifier unit (PRU) in the rectifier shelf via the A1 connector. The PRU is buffered by 4 IR-30EC batteries.

Ringing

For the delivered standard application the ringing connector E1 is not used.

The ringing voltage the ONU Subshelf is fed by the internal ringing generator unit (RGU) which is inserted in the ONU Subshelf. For pure ISDN applications or for broadband-only applications the RGU is not required.

Alarming

For alarming the D1 connector is used which is connected to the backplane of the rectifier shelf. There are 7 environmental alarms for fan and power failures collected on the backplane. The alarm meanings are not changeable by the customer; for the alarming concept see Chapter 2.1.5, page 2-15.

Testing

For the optional metallic test path the C1 connector is used. For testing the test application pack TAP100 must be used.

For the pinning of the connectors see Chapter 4.4.1, page 4-10; for the connections of the test application path see Chapter 6.5.9, page 6-21.

2.3.2.2 Jumpers on the ONU Subshelf

The ONU Subshelf is equipped with a DIP switch with 8 switches. The DIP switch is located on the ONU backplane near the position where the OCP has to be inserted. The DIP switch is front accessible if the OCP is not inserted.

The figure below shows the location of the DIP switch. For adjusting see Chapter 6.5.5, page 6-13.

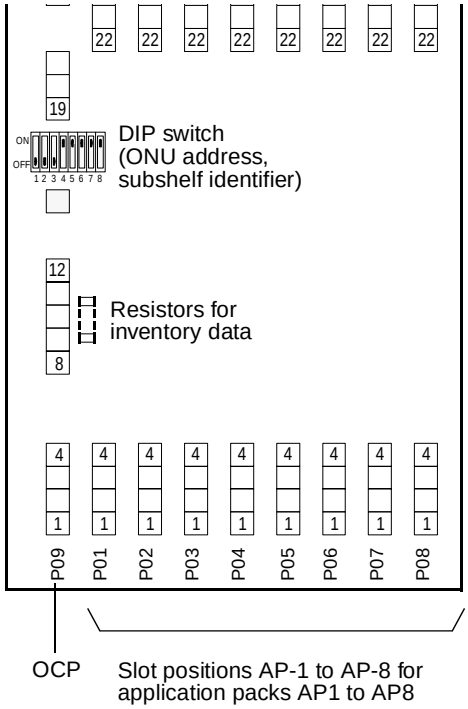


Figure 2-9 ONU backplane arrangement as viewed from front (no pack inserted)

This DIP switch uniquely identifies the ONU Subshelf in the system. The setting of the DIP switch has to be in accordance with the provisioned value in the system software.

2.3.2.3 Ringing generator unit (RGU) RGU500

Ringing generator unit

The ringing generator unit (RGU) is inserted into the upper slot position of the ONU Subshelf.

The ringing generator output is 86 V_{rms} superimposed due to the DC supply voltage of the PRU.

The ring return path (TRG0) is invisibly connected to the -48 return path (-48RTN) inside the RGU. If the RGU is removed this connection does not exist anymore.

The ringing frequency is adjustable via two jumpers to: 17, 20, 25, 50 Hz. The factory installed frequency is 25 Hz, for adjusting see Figure 4-31, page 4-39.

2.3.2.4 Optical controller pack (OCP) CPF500

Overview

The optical controller pack (OCP) provides an interface between the ONU backplane and the optical link using a Class 1 Laser.

The fiber of the optical link is connected to the OCP via an optical SC-type connector located on the OCP faceplate.

The OCP is located in slot 1 of the ONU. The OCP is a non-protected pack. The OCP supports narrowband as well as broadband services.

The remote maintenance connection interface (RMC) enables the craft personnel to connect to the COMDAC in the *AnyMedia* Mainshelf via a GSI to perform maintenance functions as long as the optical link is working.

Figure 4-13, page 4-19 shows the OCP faceplate, lists the function and color of the LED indicators, jacks and connectors on the faceplate.

2.3.2.5 Application packs for the ONU Subshelf

APs

The application packs usable in the ONU Subshelf are:

- Application packs for narrowband services:
  - for the packs usable see APs for NB services on page 2-5
- Application packs for broadband services
  - for the packs usable see APs for BB services on page 2-5
- Test application pack
  - TAP100 (1 metallic test path for the Equipment side towards the subscriber/customer and for the Facility side towards the local exchange).

For the application pack connectors and the faceplates see Chapter 4.5.2, page 4-22.

2.3.3 Rectifier shelf

Rectifier shelf

The ONU for indoor applications is configured with an internal rectifier shelf designed for the power rectifier unit (PRU) and the low voltage disconnect unit (LVD). LVD and RGU are delivered separately.

2.3.3.1 Rectifier shelf backplane

From the rectifier backplane, cables are routed to the ONU Subshelf for powering/alarming and to the fan unit. Also the door switch is connected via the backplane.

Connector J201 is the -48 V power connector and is connected to the ONU Subshelf, connector A1.

Connector J202 is the output alarm connector for the rectifier shelf. 7 environmental alarms for the rectifier, the batteries, the fan and for the LVD are used. For the alarms see Table 2-4, page 2-17. J202 is connected to the ONU Subshelf, connector D1 for the alarm inputs.

J203 is the power and alarm connector for the 7A fan unit.

The blade terminal E1 is used for interconnecting -48RTN and FRMGND. The terminal is connected to the M4 earthing point inside the ONU housing.

The blade terminals E2 and E3 are connected to the door switch for door alarming.

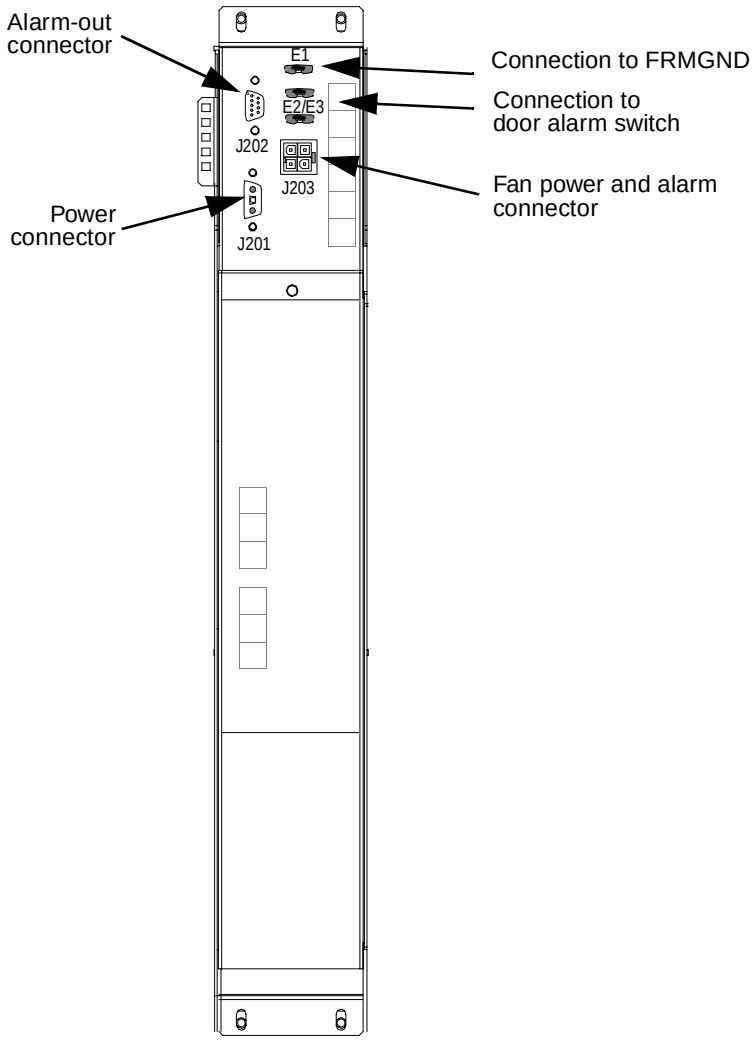


Figure 2-10 Backplane of the rectifier shelf

2.3.3.2 Power rectifier unit (PRU) RS0540

Rectifier

The power rectifier unit (PRU) is fed by AC mains (93 V up to 264 V; 47 Hz up to 63 Hz) via an IEC 60320 AC power inlet. The rectifier is buffered via 4 IR-30EC batteries which are connected to the PRU via the internal low voltage disconnect unit (LVD). This rectifier must be connected with the AC power cord 848506820.

NOTE:
For the first deliveries the rectifier is equipped with an IEC 320 AC inlet. These rectifiers require the appropriate power cord 848471181 for the IEC 320 inlet, see also Figure 6-13, page 6-28.

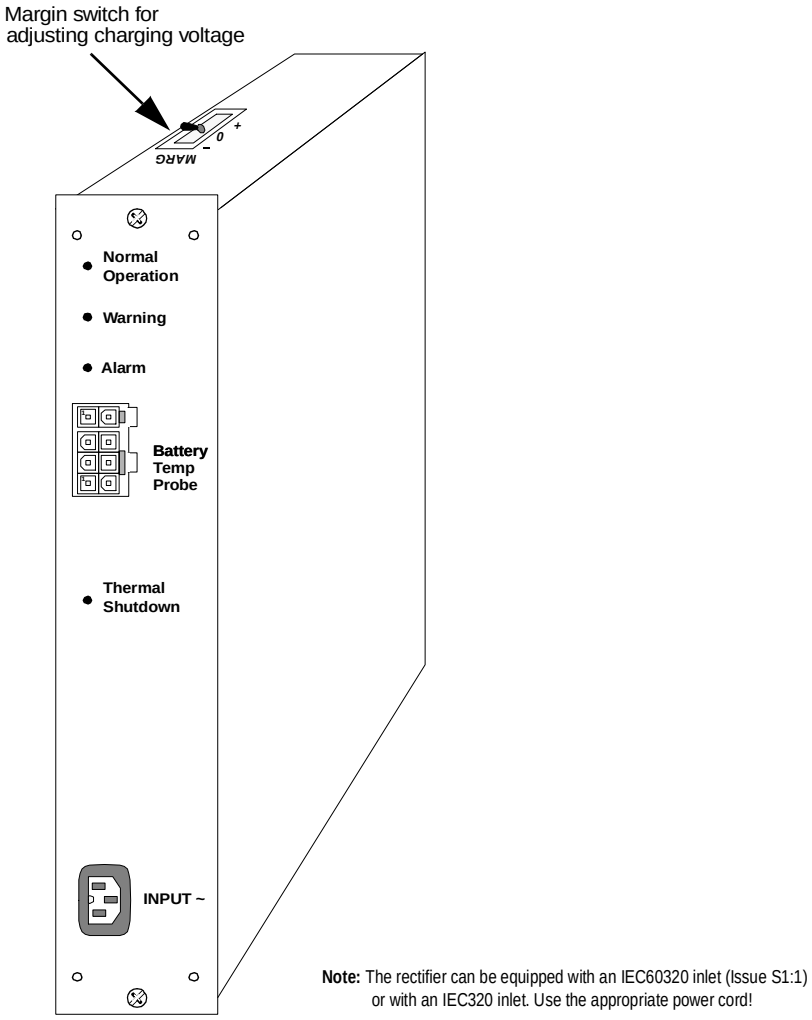


Figure 2-11 Faceplate and Margin switch of the power rectifier unit

2.3.3.3 Low voltage disconnect unit (LVD) LVD500

Low voltage disconnect

The LVD is designed for connecting the 4 IR-30EC batteries to the PRU. The LVD is equipped with an automatic battery disconnect feature which disconnects the batteries automatically from the load if the battery voltage is <-42.5 V.

NOTE:
The LVD reconnects the battery to the load if the battery voltage has reached approx. -48 V. When the LVD disconnects the batteries from the load, the batteries will still be charged in the meantime by the PRU - if the PRU is working.

In the case of a short the battery circuit breaker will trip if the current exceeds the nominal value (15 A). The circuit breaker is of the single-pole type, the -48V path is protected.

Additionally a front-accessible GMT-type fuse (15 A) is used for protecting the -48RTN path.

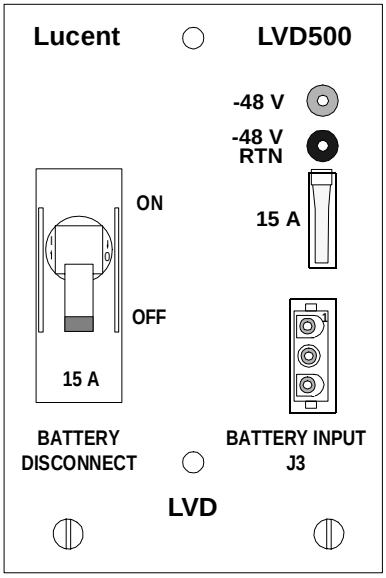


Figure 2-12 Faceplate of the LVD

Test jacks for -48 V

The LVD is equipped with test jacks for the -48 V. These jacks are connected directly between the batteries and the battery fuse/circuit breaker, see also Figure 2-3, page 2-8.

The rectifier output voltage measured on these terminals will be decreased by a voltage drop caused by the internal protection resistors and the internal resistance of the rectifier equipment. The voltage drop depends on the input resistance of the multimeter used.

NOTE:
At the moment the LVDs are equipped with two protection resistors of 100 kΩ. Therefore the voltage drop is approx. 1 V if the standard multimeters are used.

2.3.4 7A fan unit

The ONU is factory equipped with the 7A fan unit to ensure correct heat dissipation.

The fan unit should be replaced after 40,000 working hours (approx. 4 years and 7 months if working 24 hours a day) to ensure efficiency.

For filtering the fan unit works with a replaceable fan filter.

The fan filter can be replaced during operation. The fan must not be de-energized. The filter can be cleaned externally by low-pressure warm water or with a vacuum cleaner.

The lifetime of the filter depends on the environmental conditions; for maintenance of the fan unit and the fan filter see Chapter 11.3, page 11-2.

The following figure shows the fan with the fan filter.

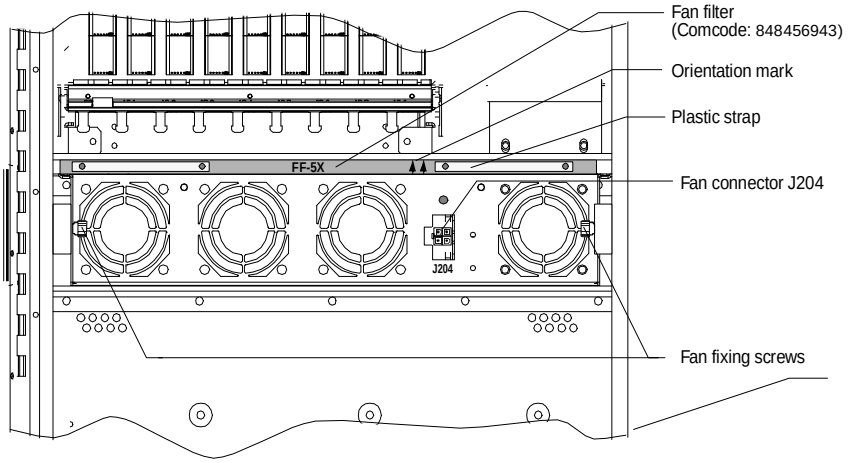


Figure 2-13 Position of the fan unit with the fan filter

2.3.5 IR-30EC batteries

The ONU is buffered by 4 valve-regulated, lead-acid type (VRLA-type) batteries, which are delivered separately with all connecting accessories.

For easy interconnecting the batteries are factory equipped with a 14 AWG lead assembly terminating with a preconnected keyed 2-pin plug.

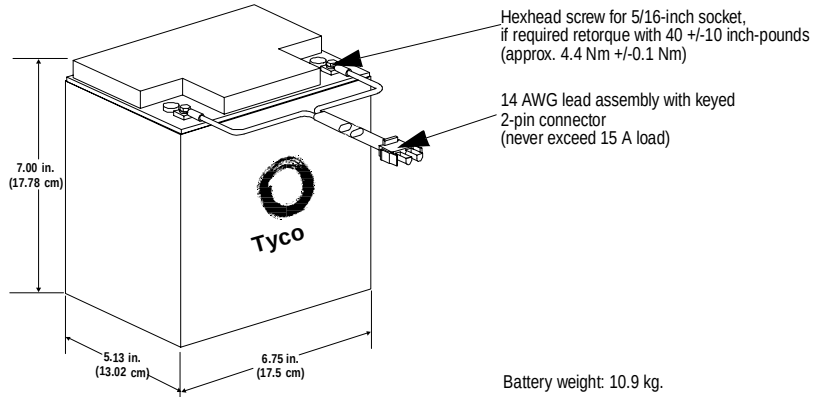


Figure 2-14 IR-30EC battery

2.3.6 Labeling and numbering

The packs are equipped with labels for the following:

- Apparatus Code (e.g. LPZ100)
- Common Language Equipment Code (CLEI)
- Interchangeability Code (ICC)
- Serial Number (SN).

The ONU housing is equipped with an identification label.

2.3.6.1 Door label of the ONU housing

Inside the door of the ONU housing the combined warnings and parts label is attached.

On the label all parts of the ONU can be identified.

2.3.6.2 Identification and marking of cables and connectors

All cables are marked with the following:

- A label for cable Comcode or for the cable Equipment Code
- A label on the connectors, specifying the positions where the connectors are to be plugged in.

2.3.6.3 Battery label

A combined warnings and installation label is attached to each battery.

During installation the installation date must be recorded to this label by the installer.

2.4 General installation information

The applications and services of the *AnyMedia* optical network unit are supported by a wall-mounted indoor housing. This section provides an overview of the installation activities, lists the tools and measurement instruments and details the housing configuration for the current *AnyMedia* optical network unit.

2.4.1 Tools and measurement /testing instruments

Tools and measurement instruments

The following is a list of tools and test equipment that is needed to unpack the racks and to complete the installation of the *AnyMedia* optical network unit.

NOTE:
The equipment and/or materials required depends on the particular installation.

Table 2-5 List of tools and equipment

Use for	Tools	Remark
Basic	ESD wrist strap	
	Wire cutters (up to 6 mm^2) and strippers, diagonal cutting pliers, coated-wire stripping tweezer, multi-purpose knife, extension cable 5 m	
	Torque wrench (up to 70 inch-lbs; up to 7 Nm)	
	Hand tool kit: screwdriver sets for standard slotted, Pozidrive and Phillips, wrench sets (open-end/double hex, hexagon socket head/ball-end), universal and pointed pliers, flat and round file with handle, nut drivers, level (350 mm) and back square, string tape measure/folding rule (2 m) etc.	
	Large tool kit: hammers, claw bar, etc.	
	8 inch/20 cm long flathead screwdrivers (slotted 4 mm and Phillips No. 1)	
	Waterproof fine line marker	
	Floor drilling equipment: roto-hammer or percussion drill with sintered carbide/stone drills (only if required)	

Table 2-5 List of tools and equipment –*Continued*

Use for	Tools	Remark
Batteries	Splash-proof safety goggles	
	Cleaning cloth	
	Protective gloves	
	Sandpaper or abrasive cloth	
	Insulated slip joint pliers (6-1/2 inch/16 cm)	Only if required
	Insulated socket driver or nut driver set (1/4-inch through 3/4-inch sockets)	
	Insulated combination wrench set (1/4-inch through 3/4-inch)	
	Insulated screwdrivers	
Special: fiber, cabinet, ... (only if required)	Lifting and transport equipment: hoists, dolly trucks, straps, etc.	
	Pinch bar, claw-type hammer and plate shears	
	Crimp tool for various connectors of ID type (D-sub)	
	Cable crimpers for 0.5 to 6 mm^2 (for example for *Molex*[a] connectors (No.: 11-01-197))	
	Splice equipment with accessories (for example from Fujikura)	
	Heat-shrink gun	
	Soldering iron (70 W and 20 W) or soldering station with temperature control, solder tin and holder for soldering iron	
	Wire replacement/insertion tool for *Molex/Faston* connector pins	
	Fuse puller for GMT fuses (for example from Hendry Telephone Products or from Lucent: WP90247, Comcode 406420273)	
	Multi-layer tissues made from non-recycled cellulose or optical quality tissue/lens cleaning paper (for example 9300-0761 of Hewlett-Packard), cotton swaps/Q-tips (for example 9300-1351 of Hewlett-Packard), adhesive cleaning tape (for example 15475-68701 of Hewlett-Packard), isopropyl alcohol (without additives), pipe cleaner with soft bristles (for coupling cleaning) or fiber cleaning kit (for example kit 15475A from Hewlett-Packard)	Only if required and depending on fiber and fiber test equipment used
	Purified compressed air (for example spray can)	
	Optical microscope, enlargement >40 up to 200, (for example type M10 from Wild or the FIND-R-SCOPE of FJW Optical Systems, Inc.)	

Table 2-5 List of tools and equipment –*Continued*

Use for	Tools	Remark
Test equipment (only if required)	DMM (Digital Multimeter) Tek DM254 or *Fluke*[b] 8060A or equivalent (the accuracy of an equivalent meter should be 0.05 percent on the DC scale), insulated test leads with a diameter of 2 mm for the probe tips are required for measurement via the battery connectors or via test jacks (on LVD)	
	DC current converter or current probe 1:10 for multimeter used for up to 20 A	
	Test load of 48 V, 15 A (additional only)	
	Thermometer for ambient temperature measurement	
	Contact thermometer for battery temperature measurement	
	Test equipment for drop test/physical line testing (in the U.S., e.g. ITE-6675 Streak Mate, ITE-7079 AIU Test Fixture; additional only)	
	Fiber test equipment/optical power meter (1310/1550 nm); for example: Reflectometer *Wavetek*[c] MTS5100 (optical time domain reflectometer), *Wavetek* OLP-6 or OLP-15B (optical power meter for fiber receiver); *Wavetek* OLS-6 or OLS-15 (optical light source for fiber transmission).	

a *Molex* is a registered trademark of Molex Inc.

b *Fluke* is a registered trademark of Fluke Corporation.

c *Wavetek* is a registered trademark of Wavetek Wandel Goltermann, Inc.

2.4.2 Principle of installation activities and test sequences

Installation activity

Installation and test operations for the *AnyMedia* optical network unit are outlined in this manual as sequential procedures. For ease of operation, it is recommended that the format and sequence listed herein be followed.

NOTE:
Before starting with mounting or cabling activities the correct grounding must be done.

Installation sequence

The installation sequence for an *AnyMedia* optical network unit is as follows:

- The installation operation starts with the wall space preparation, unpacking the ONU and checking the completeness of delivery.
- The next installation step consists of setting up and fastening the ONU to the wall, grounding the ONU properly, checking the factory assembled ONU and checking the internal functional wiring and cabling.
- The cable routing may begin either at the main distribution frame (MDF) or at the ONU or simultaneously at any combination, depending upon the availability and deployment of personnel.
- If required the optional TAP-B cable should be installed at first because the cable opening of the ONU housing is too small for easy installation after the AP cables are inserted.
- Then all the delivered AP cables have to be routed to the AP positions and have to be connected to the blank faceplates.
- The connections on the MDF can be carried out and if required the cross-connections for the metallic test path can be made. These steps can also be carried out later.
- If ADSL APs are used the possibly required rerouting of POTS subscribers can be done.
- The ONU Subshelf identifier inside the ONU Subshelf must be adjusted.
- The delivered power cord has to be connected to the customer's AC mains.
- The four IR-30EC batteries have to be installed mechanically and connected to the internal battery cable.
- The ONU Subshelf has to be equipped with the ringing generator unit (RGU).
- The rectifier shelf has to be equipped with the power rectifier unit (PRU) and with the low voltage disconnect unit (LVD).
- AC mains has to be powered up and the rectifier voltage must be checked.
- The battery cable has to be connected to the PRU and the batteries have to be charged for the first time.
- The fiber cable has to be installed and should be checked.
- The ONU Subshelf has to be equipped with the OCP and with APs.

2.4.2.1 Cabling directions for the ONU Subshelf

Cabling directions for the ONU Subshelf

The figure below shows the cabling directions in the ONU Subshelf.

The ONU will be delivered with all internal cabling. Most of these cables are connected to the correct position. For these cables the installer has only to check that the cables are correctly fastened. For 3 cables the installer must connect the cables to the batteries and to the PRU and LVD which are mounted during installation.

All external cables route to the right side.

For all ONU cables see also Figure 6-4, page 6-7.

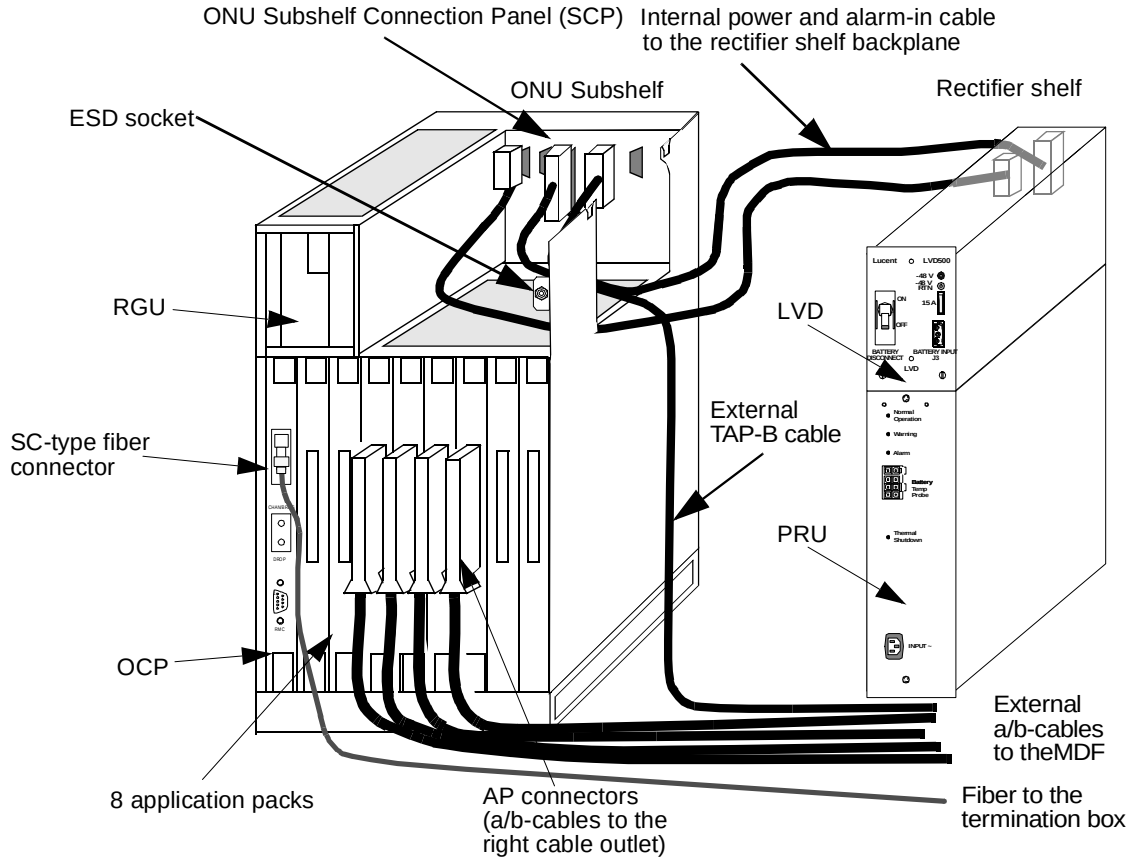


Figure 2-15 ONU Subshelf cabling arrangement

2.4.3 Tests

Test procedures

The test procedure in this manual consists of voltage readings and wiring continuity checks only.

NOTE:
The turn-up tests may be performed when all activities covered in this installation manual are completed. The turn-up procedures and the other test procedures are covered in the *AnyMedia* User Service Manual (USM), ordering number 363-211-116.

Parts lists and kits

3

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Contents

Parts lists and kits

3

3.1 General information

This section provides general information to be used for checking the basic material and hardware necessary for the complete installation of the wall-mounted *AnyMedia*® Optical Network Unit (ONU) for indoor applications. This material includes:

- the basic ONU system hardware, see Chapter 3.2, page 3-2
- and the required ancillary equipment, see Chapter 3.3, page 3-4
- and the batteries, see Chapter 3.4, page 3-8.

Test equipment necessary for the turn-up, testing and maintenance of the system are not listed here. Complete detailed ordering information can be found in the Applications, Planning, and Ordering Guide (APOG, 363-211-110).

3.2 Basic *AnyMedia* optical network unit hardware

3.2.1 ONU for indoor applications in wall-mounted housing

ONU assembly The following table lists all equipment delivered with the *AnyMedia* optical network unit (ONU).

Table 3-1 Wall-mounted ONU for indoor applications

Orderable Item Number		The Orderable Item Number includes the following main parts:		
ED7C841-01 Gr.1 (601 948 946)		**Consisting of: (product identifier)**	**Quantity per code**	**Description**
	assembled or built-in	n.a.	1	ONU indoor housing for wall-mounting with: door and door key[a] door switch (407667658), cable access cover (848403796), 2 power/ringing bridges[b] (848461489)
		J1C289AA-1, L1	1	ONU Subshelf (empty)
		J1C290AA-1, L1	1	Rectifier shelf (empty)
		108583428, S1:1	1	7A fan unit (C-1669, No. 848403754-A), with the a removable filter (848456943) already inserted[c]
		see Table 3-2, page 3-3		Internal cabling
	separately packed	402375265	30	Set of cable ties 110 mm[d]
		996747689	12	Set of cable ties 170 mm[d]
		408026243	5	GMT-type fuse 15 A[d]
		848403937	1	Mounting bracket with 9 hexagonal or round-head wood screws[d]
		848487096	1	Drilling template[d]
			1	Packing list

a Attached inside the door.

b 2 bridges are already assembled on the ONU Subshelf backplane (positions: "PFU BYPASS" and "RING INT"). The bridges have to be reassembled on the backplane of the ONU Subshelf for other powering/ringing variants during initial installation. The ONU Subshelf must be removed from the ONU housing for reassembling.

c Already installed in the fan unit. The replaceable Fan Filter FF-5X (Class 2, 324A, Product Identifier: 848456943) has to be replaced for maintenance (cleaning/replacing interval is about 3 to 6 months).

d Separately packed, located in the lower battery compartment.

Internal cables, already connected

The following internal cables are provided with the 601 948 946 ONU assembly and are already connected to the correct positions inside the ONU.

Table 3-2 Internal cables already equipped for the ONU

Equipment Code	Qty.	Description	Connection between: Destination 1	Destination 2
848456984	1	Power cable for internal -48 V DC	Rectifier shelf backplane: male J201	ONU Subshelf: male A1
848457008	1	Alarm-in cable	Rectifier shelf backplane: female J202	ONU Subshelf: female D1
848456950	1	Fan cable	Rectifier shelf backplane: male J203	7A fan unit: male J204
848456968	1	Battery set cable[a]	LVD: female J3	Battery dangler cable connectors (female) for battery 1 to 4
848444469 Issue 2	1	Ring-type thermal probe[b] (M8 lug) with cable	Rectifier: male battery temp. probe connector	Battery 3: ring-type lug inserted between the metallic case and battery
848471181 Issue 1	1	AC mains power cord[c] 3 m (≈10 feet)	Rectifier: male IEC 320 AC mains inlet "Input~"	Customer's mains, open end (for fixed interconnection)
848506820		AC mains power cord[d] 3 m (≈10 feet)	Rectifier: male IEC 60320 AC mains inlet "Input~"	
848456992	1	Intrusion door switch cable	Rectifier shelf backplane: E2, E3 (blade terminal)	Door switch on upper right corner of the ONU housing: the two lower terminals E2, E3
848467189	1	Interconnection wire (FRMGND - 48VRTN)	Rectifier shelf backplane: E1 (blade terminal)	Upper M6 grounding stud inside the ONU housing

a Not connected, batteries and LVD will be mounted during installation.

b Not connected, ring-type thermal probe will be inserted between the outer metallic cover and the of housing of battery 2 during installation.

c Can only be used with the older rectifier with the IEC320 inlet! The cable is not connected, the rectifier will be mounted during installation. Connection to customer's mains after installation.

d Can only be used with the S1:1 rectifier with the IEC60320 inlet! The cable is not connected, the S1:1 rectifier will be mounted during installation. Connection to customer's mains after installation.

3.3 Packs/units and additional equipment

Overview

The following table lists all the separately delivered packs and additional equipment which is not included in ONU assembly and which has to be ordered separately to configure the *AnyMedia* Access System according to the functions and features to be provided.

3.3.1 Orderable packs/units for the ONU

The following 4 packs/units have to be ordered separately for each ONU. These parts are always required except the ringing generator which is only required for POTS applications. They are delivered with the ONU housing in a separate packaging.

Table 3-3 Orderable packs/units (item 2 to 4 always required)

Item	Quantity per ONU	Comcode / Orderable Item No.	Equipment Description	Apparatus Code
1	1	108489741	Ringing generator unit[a] (RGU)	RGU500
2	1	108741265	Optical controller pack for ONU[b] (OCP)	CPF500 Issue S2:3[c] or later
3a	1	108595844	Power rectifier unit 540 W (PRU) with IEC320 inlet[d] (not to use anymore)	RS0540
3b		108595844	Power rectifier unit 540 W (PRU) with IEC60320 inlet[e]	RS0540 Issue 1:1 or later
4	1	108784109	Low voltage disconnect unit (LVD)[f]	LVD500 Issue 2:2 or later

a Not required for xDSL-only or ISDN-only applications.

b Must be inserted into slot 1 of the ONU Subshelf. In the *AnyMedia* Mainshelf the optical AP (OAP), the COMDAC and the CIU are required.

c Only the new Issue S2:3 OCP may be used.

d This rectifier requires the power cord 848471181 with the IEC320 plug. Not used for newly deployed ONUs.

e This rectifier requires the power cord 848506820 with the IEC60320 plug. Delivered for all newly deployed ONUs; this rectifier and power cord combination is recommended for replacement.

f Must be equipped with 1 GMT-type fuse of 15 A (408026243). Five GMT-type fuse of 15 A (408026243) are packed separately for spare.

NOTE:
The ringing generator unit can be used for internal ringing if the ONU is internally powered with -48 V via the power rectifier unit. Using the RGU is the standard application.

For packs required in the *AnyMedia* Mainshelf, see Chapter 3.6, page 3-10.

The following packs can be ordered separately also, but type and number are customer dependent and dependent on the services to provide.

Table 3-4 Orderable packs (site-dependent)

Item	Qty/Shelf	Comcode	Equipment Description	App. Code
1	0 or 1	108045360	Test Application Pack (for the metallic test path)[a]	TAP100
2	0 to 3[b]	108463241	POTS AP (without PPM), 32 Z ports[c]	LPZ100C
3	0 to 4[b]	108134719	POTS AP (with PPM), 24 Z ports[c]	LPP100B
4a	1 to 3[b]	108692971	POTS AP, country-specific, 32 Z ports[d] (without PPM, reduced TAP capability, fixed balance network and fixed termination impedance)	LPZ120B
4b	1 to 3[b]	108692989		LPZ121B
4c	1 to 3[b]	108692997		LPZ122B
5	0 to 4[b]	108506387	ISDN AP (2B1Q), 12 U ports[e]	LPU112
6	0 to 3[b]	108488396	ISDN AP (4B3T), 16 U ports[e]	LPU430
7	0 to 8[b f]	108708835	SHDSL AP with 8 duplex-mode SHDSL ports (and 4 duplex E1 ports, unstructured)	LPS510
8	1 to 8[b f]	108905332	HDSL AP for 4 ports (V5 ISDN PRA, V3 ISDN PRA, VLL, GLL, 2 duplex E1 ports, unstructured)	LPS504[g]
9	1 to 8[b, h]	108603945	ADSL4p AP (4 ADSL ports/4 splitter for Z ports)[i]	LPA400B[j]
10	1 to 8[b h]	108550005	ADSL8p AP (8 ADSL ports/8 splitter for Z ports)[i]	LPA408
11	1 to 8[b h]	108708827	ADSL16p AP (16 ADSL ports/16 splitter for Z ports)[i]	LPA416
12	1 to 8[b h]	109026567	ADSL16p AP (16 ADSL ports/16 splitter for Z ports, low resistance test path)[i]	LPA419[k]
13	1 to 8[b h]	108610932	ADSL4i AP (4 ADSL ports/4 splitter for ISDN ports (with 2B1Q/4B3T)[i]	LPA414
14	1 to 8[b h]	108796343	ADSL16i AP (16 ADSL ports/16 splitter for ISDN ports with 2B1Q/4B3T)[i]	LPA417
15	1 to 8[b]	108695529	SDSL16 AP (with 16 SDSL ports)[i]	LPS716

a Optional, only required for internal testing.

b Choose a mix of items 2 to 13 to a total number of 96 POTS/ISDN subscribers or 192 HDSL/SHDSL subscribers at maximum. The other slots can be equipped with xDSL packs, see APOG, system capacity.

c On an LPZ100C the services ALL and POTS are provisionable exclusively for the whole pack (programmable per pack). On an LPP100B the services ALL and POTS are provisionable for every Z port of the pack (programmable per port).

d The LPZ12xB APs are country-specific and cost-efficient variants of the LPZ100C (LPZ120B used for China, LPZ121B used for Taiwan, LPZ122B used for Brazil). For details please ask your local Customer Team.

e If ISDN is included 1 or 2 HDLC packs must be used in the *AnyMedia* Mainshelf except only leased lines n x 64 kbit/s are used.

f For the customer's equipment on the remote side a network termination unit (NTU) is required.

g The formerly deliverable HDSL APs LPS501 (108447996; V5 ISDN PRA, VLL, GL) and LPA/503 (108841925; V5 ISDN PRA, V3 ISDN PRA, VLL, GLL) are replaced by the LPS504 for newly deployed ONUs.

h For the customer's equipment on the remote side a splitter and an ADSL modem are required.

i If xDSL is included the COMDAC, the CIU and the AFM pack must be used in the *AnyMedia* Mainshelf. Only LPA400B packs may be used, do not use LPA400 packs.

j The formerly deliverable ADSL4 APs LPA400 (108603945; no G-lite) are replaced by the LPA400B for newly deployed ONUs.

k The LPA419 replaces the LPA416 for newly deployed ONUs.

For all ADSL modems and network termination units (NTU) recommended for *AnyMedia* Access System, see the ordering section of the APOG.

3.3.2 Orderable external cables and fibers

External copper cables

These cables are required to connect the *AnyMedia* optical network unit to the MDF (a/b cabling, Z cabling, TAP cabling). The cables are deliverable in different lengths with a connector at one end.

Table 3-5 Orderable external cables for APs

Item	Qty.	Comcode	Equipment Description	Equipment Code
1	1 per AP (POTS/ ISDN/ xDSL/ HDSL/ SHDSL/ TAP100)	601888084	32-pair T/R cable, 50 ft (≈ 15 m) (VF, a/b-cable)	ED7C818-30 Gr1
		601888092	32-pair T/R cable, 100 ft (≈ 30.5 m) (VF, a/b-cable)	ED7C818-30 Gr1A
		601888100	32-pair T/R cable, 200 ft (≈ 61 m) (VF, a/b-cable)	ED7C818-30 Gr1B
		601888118	32-pair T/R cable, 300 ft (≈ 91.5 m) (VF, a/b-cable)	ED7C818-30 Gr1C
2	1 per TAP100[a]	601911100	8-pair TAP-B cable, 50 ft (≈ 15 m)	ED7C818-36 Gr1
		601911118	8-pair TAP-B cable, 100 ft (≈ 30.5 m)	ED7C818-36 Gr1A
		601911126	8-pair TAP-B cable, 200 ft (≈ 61 m)	ED7C818-36 Gr1B
		601911134	8-pair TAP-B cable, 300 ft (≈ 91.5 m)	ED7C818-36 Gr1C
3	1 per SHDSL AP[b]		8-pair E1 cable for 20-pin AMP connector (AMPLIMATE .050 series)	ED7C860-30 Gr.x

a Optional, only required for internal testing. Cable connected to the ONU Subshelf connection panel.

b For future deliveries.

NOTE:
Please select from the given lengths of each position the suitable length between *AnyMedia* and the MDF/DDF. The 32-pair T/R cable, also named a/b-cable or VF cable, is used for POTS, ISDN, ADSL, HDSL, SHDSL, SDSL and the TAP100 pack.

One serial cable is required for connecting the PC GSI.

Fibers

For establishing the optical link from the OCP to the fiber termination unit or to the splice box the 1 fiber jumper with SC/SC-type connectors of about 10 m length can be ordered.

Table 3-6 Orderable fibers

Item	Qty.	Comcode	Equipment Description	Remark
1	1	408267532	Fiber Jumper Cable with SC/SC connector, 30 ft (≈ 10 m)[a]	To fiber splice box outside of the ONU

a With protective spiral wrap of about 3 ft (≈ 1 m) on the ONU side.

3.3.3 Orderable customer documentation

For the ONU installation only the Installation Manual for Indoor Applications is required.

For a detailed view of all the orderable *AnyMedia* Access System documentation, see Table 2, page -XXVIII in the Chapter *About this document*. For the content of the CD-ROM in detail, see Chapter Table 2, page -XXVIII.

3.4 Batteries

Overview

The following chapter lists additional equipment which is not included in the ONU Subshelf and has to be ordered additionally to configure the ONU according to the functions and features to be provided.

The following table lists the orderable valve-regulated, lead-acid type (VRLA-type) batteries, which are delivered with all connecting accessories. The 4 batteries are packed in one wooden box. All the other accessories are packed in one plastic bag which is also packed in the wooden box.

Table 3-7 Orderable batteries

Qty.	Comcode	Type	Consisting of:	Comment
4	407928761	IR-30EC	12-volt, valve-regulated, lead-acid IR Series I battery, 25 Ah, lifetime 5 years (at 25°C), equipped with 14 AWG lead assembly terminating with keyed, pre-connected 2-pin plug[a]	Dimensions (WxDxH): 17.2 x 13.0 x 17.8 cm, Weight: 10.9 kg.
1	107078859	157-622-020	Product Manual: IR-30EC and IR-40EC Series I Batteries KS-2381	
1			Battery type label	Sticker attached already at delivery

a Replacement parts for the plug, see Table 3-8, page 3-9, items 9 and 10.

IR Series I batteries are flame redundant, non halogenated, meet UL 94/ V-0 and exhibit an oxygen index greater than 28. They comply with the requirements for sealed battery/cell pressure release test of UL1989, Standard for Standby Batteries.

NOTE:
The 14 AWG lead assembly was designed to be compatible with Tyco' applications where reserve power of 5 hours or longer duration is required. The assembly may not be suitable for applications or boost charging where the battery load/charge exceeds the 5-hour rate, and may fail catastrophically at battery charge/discharge currents exceeding 18 A.

3.5 Components of the ONU for replacement

The following components of the ONU housing can be ordered additionally for replacement.

Table 3-8 Orderable components of the ONU housing for replacement

Item	Quantity per code	Comcode / Orderable Item No.	Equipment description	Remark
1	1	(848403804)[a]	ONU door	
2	1	848403796	Cable access cover	
3	1	407667658	Door intrusion switch	
4	1	n.a.[a]	Door key	
5	1	848456943	Removable fan filter FF-5X (Class 2, 324A)	
6	5	408026243	Set of GMT-type fuses 15A	
7	2	848461489	Power/ringing bridge	
8	1	408267532	Fiber Jumper Cable with SC/SC connector, 30 ft (≈ 10 m) with protective spiral wrap of about 3 ft (≈ 1 m) on the ONU side	
9	1	AMP order No.: 1-480698-0	AMP 2-pin plug housing used for 14 AWG lead assembly for IR-30EC batteries	Only for replacement of the 14AWG lead assembly plug
10	1	AMP order No.: 350537-6	Crimp contact for the AMP 2-pin plug used in the 14 AWG lead assembly for IR-30EC batteries	

a Call the local customer support for assistance.

3.6 Additional information

In the *AnyMedia* Mainshelf the following packs are required to establish the optical link to the ONU.

Table 3-9 Packs required in the *AnyMedia* Mainshelf

Item	Quantity per *AnyMedia* Mainshelf	Comcode	Equipment description	Apparatus Code
1	1 to 8[a]	108489717	OAP	LPF500
2	1 or 2	108597238	COMDAC[b]	COM501
3	1	108403197	CIU[c]	DTP500
4	1 to 4	108835018	IO_E1[d]	FAC500B
5	1 or 2	108644402	IO_HDLC[e]	IDC500B
6[f]	0 or 1	108348251	AFM_E3[g]	LPA910[h]
7[f]	0 or 1	108108275	AFMDS3[g]	LPA900[h]
8[f]	0 or 2	108875105	AFM_E3[g] (duplex ready)[i]	LPA911
9[f]	0 or 2	108875097	AFMDS3[g] (duplex ready)[i]	LPA901
10[f]	0 or 2	108371246	AFMO[g] (duplex ready)	LPA920
11[f]	0 or 1	108694894	AFME1[g]	LPA941

a One OAP is required per linked ONU. 8 ONUs can be linked at maximum to one *AnyMedia* Mainshelf if no broadband services have to be supported. If broadband services have to be supported additionally, 7 ONUs can be linked to one *AnyMedia* Mainshelf (slot AP16 is occupied by the AFM pack).

b Only the COM501 may be used for ONU applications. Do not use the COM500 pack.

c Recommended for all *AnyMedia* Access System applications.

d Required for narrowband services in the ONU.

e Required for ISDN and HDSL services in the ONU. Only the IDC500B may be used for ONU applications. Do not use the IDC500.

f Choose only one pack type from position 6 to 11. Only for duplex mode 2 APs are required from positions 8, 9 and 10.

g Required for ADSL services in the ONU.

h The LPA 900/910, not duplex ready, are replaced by the LPA911/901 for newly deployed ONUs. Do not order these packs anymore.

i Requires coaxial Y-cables or coaxial splitters for duplex operation in the daisy chain.

Parts description

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Parts description

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4.1 General information

This chapter describes for the *AnyMedia*® Access System connectors and parts to which cables or wires are connected.

Also the connections inside the internal cables are shown.

NOTE:
Not all connectors/cables described below are used in each *AnyMedia* Access System.

4.2 General cable description

4.2.1 Types of cables

Types of cables

There are two types of cables:

- Internal cables/wiring, which connect all assembled parts within the ONU.
- External cables, which connect to parts outside the ONU housing (e.g. to main distribution frame (MDF) and to the mains).

Internal cables

All internal cables are factory assembled. They are connected to the correct connectors at delivery.

External cables

The external cables can be prefabricated (equipped with at least one connector). For other powering variants the power and the ringing cables have to be assembled completely on site by the installer/customer.

Prefabricated external cables

The external prefabricated cables and connectors must be ordered separately, see Chapter 3.3.2, page 3-6.

The external cabling consists of:

- a/b-cabling (POTS lines, ADSL lines, ISDN lines, HDSL lines) for connections from the application packs (AP) to the main distribution frame (MDF)
- TAP test pair connections from the test application pack (TAP) to the MDF for circuit/subscriber testing facilities
- Fiber cable with two SC connectors to the OCP and to the fiber termination box, see Chapter 9
- Earthing connection to an approved earthing terminal (not prefabricated).

NOTE:
Not all cables are required for each installation. Refer to the regional equipment engineering job specifications for a particular office application.

Customer-made external cables

Customer cables are such cables which connect the *AnyMedia* optical network unit to external customer equipment. For the standard application no such cables are required.

Cables for future use

For future and for other applications customer-made external cables can be as follows:

- Serial connection from the RCM connector to the PC GSI
- Power connections from the external –48 V power feeders
- Ringing connections from the customer's positive and/or negative ringing supplies.

These customer-made external cables must be engineered and fabricated in the field for the complete installation of the *AnyMedia* Access System.

4.2.2 Color-coding sequence for factory-assembled cables

Factory cable assembly - wire color-coding sequence

Standard wire color coding for the factory assembled cables is shown in the following tables. Use of the color coding will facilitate both terminating operations at the customer's cross-connecting points and troubleshooting routines.

The following color-coding abbreviations are used for identification on the cables.

Table 4-1 Color-coding abbreviations (if used)

Abbreviation	Identification colors
BK	black
BL	blue
BR	brown
Clear	clourless
LTG	light green
G	green
DKG	dark green
O	orange
R	red
S	slate
V	violet/purple
W	white
Y	yellow

NOTE:
The indication of two colors separated by a hyphen per wire means that the wire has a basic color marked with an additional second color, e.g. white-blue means a white wire marked with blue rings.
The indication of two colors separated by a slash means (two) twisted wires, e.g. white-blue/blue-white are twisted wires where the first wire is white with blue rings and the second wire is blue with white rings.

Table 4-2 Color-coding sequence for factory-assembled cables (32-pair)

Conductor pair no.	Connector tTerminals	Binder color	Identification colors (Tip/Ring)	Color coding
1	2, 3	blue	white-blue/blue-white	W-BL/BL-W
2	4, 5	blue	white-orange/orange-white	W-O/O-W
3	6, 7	blue	white-green/green-white	W-G/G-W
4	8, 9	blue	white-brown/brown-white	W-BR/BR-W
5	10, 11	blue	white-slate/slate-white	W-S/S-W
6	12, 13	blue	red-blue/blue-red	R-BL/BL-R
7	14, 15	blue	red-orange/orange-red	R-O/O-R
8	16, 17	blue	red-green/green-red	R-G/G-R
9	18, 19	blue	red-brown/brown-red	R-BR/BR-R
10	20, 21	blue	red-slate/slate-red	R-S/S-R
11	22, 23	blue	black-blue/blue-black	BK-BL/BL-BK
12	24, 25	blue	black-orange/orange-black	BK-O/O-BK
13	26, 27	blue	black-green/green-black	BK-G/G-BK
14	28, 29	blue	black-brown/brown-black	BK-BR/BR-BK
15	30, 31	blue	black-slate/slate-black	BK-S/S-BK
16	32, 33	blue	yellow-blue/blue-yellow	Y-BL/BL-Y
17	36, 37	orange	white-blue/blue-white	W-BL/BL-W
18	38, 39	orange	white-orange/orange-white	W-O/O-W
19	40, 41	orange	white-green/green-white	W-G/G-W
20	42, 43	orange	white-brown/brown-white	W-BR/BR-W
21	44, 45	orange	white-slate/slate-white	W-S/S-W
22	46, 47	orange	red-blue/blue-red	R-BL/BL-R
23	48, 49	orange	red-orange/orange-red	R-O/O-R
24	50, 51	orange	red-green/green-red	R-G/G-R
25	52, 53	orange	red-brown/brown-red	R-BR/BR-R
26	54, 55	orange	red-slate/slate-red	R-S/S-R
27	56, 57	orange	black-blue/blue-black	BK-BL/BL-BK
28	58, 59	orange	black-orange/orange-black	BK-O/O-BK
29	60, 61	orange	black-green/green-black	BK-G/G-BK
30	62, 63	orange	black-brown/brown-black	BK-BR/BR-BK
31	64, 65	orange	black-slate/slate-black	BK-S/S-BK
32	66, 67	orange	yellow-blue/blue-yellow	Y-BL/BL-Y

4.2.3 Connector types and connector assembly

The connectors employed in the system are generally of the following types:

- Application pack 68-pin connectors used for POTS/ADSL/HDSL/ISDN interface connections.
- D-subminiature 3-pin connectors used for DC power connectors and ringing.
- *Molex*[1] connectors with 2-pin, 3-pin, 4-pin and 6-pin arrangement used for connecting the fans, the batteries and the thermal probe.
- D-subminiature DB9 and DB37 pin arrangements used for alarming and the metallic test path.

4.2.3.1 D-type connectors

D-type connectors are provided in the system with DB3[2], DB9, and DB37 pin arrangements.

Connectors as furnished on factory equipment are either of the insulation displacement (ID) type or of soldering type. If D-type connectors furnished for use by installers are also ID type connectors then the use of special tools for wire insertion or replacement is required.

Each D-type plug/jack connector combination has an associated covering (hood) which must be installed over the connector to complete the assembly. Figure 4-1, page 4-6 depicts the D-type connectors and the hood/hardware assemblies for mating the connectors together.

Terminal numbers are embossed on the pin side of the assembly.

NOTE:
The connector's locking screws must have a thread of UNC 4-40.

1 *Molex* is a registered trademark of Molex Inc.

2 With power contacts.

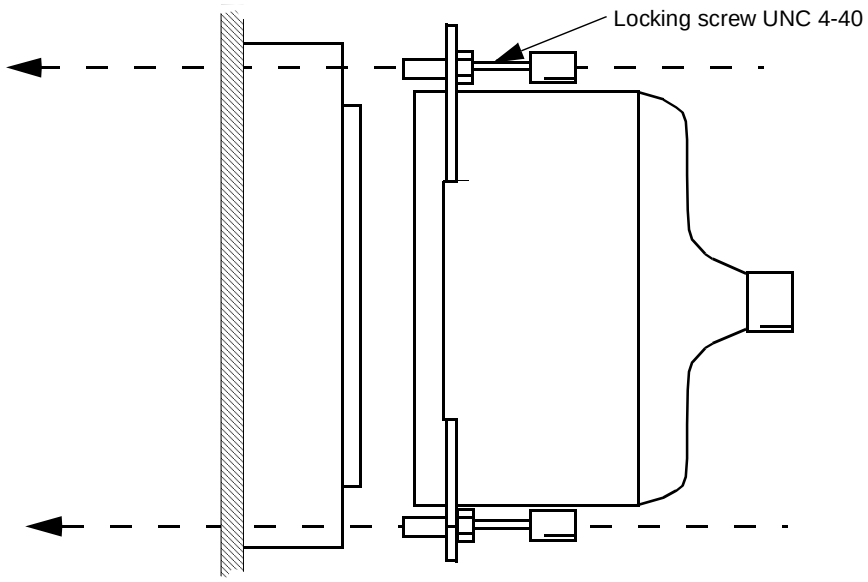


Figure 4-1 D-type connectors

4.2.3.2 General for application pack connectors

Application pack connectors as furnished on factory equipment are of the insulation displacement (ID) type.

NOTE:
If the connectors furnished for use by installers are also of the ID type then the use of special tools for wire insertion or replacement is required. Each plug/jack connector combination has an associated covering (hood) which must be installed over the connector to complete the assembly.

Each plug and jack connector has terminal numbers embossed on the pin and wiring sides of the assembly, but these numbers are only visible if the hood is removed.

NOTE:
Four pins on this 68-pin connector are shorted so that the *AnyMedia* Access System can verify whether an application pack cable is connected or not.

How to insert or to remove an application pack connector is shown in Figure 6-2, page 6-5.

For a/b-cable shielding see Figure 6-3, page 6-6.

4.3 Connectors in the ONU housing

The earthing, grounding and ESD points and the door switch are located in the ONU housing.

4.3.1 Grounding connecting points (M6)

The figure below shows the positions for earthing, grounding and for the door switch.

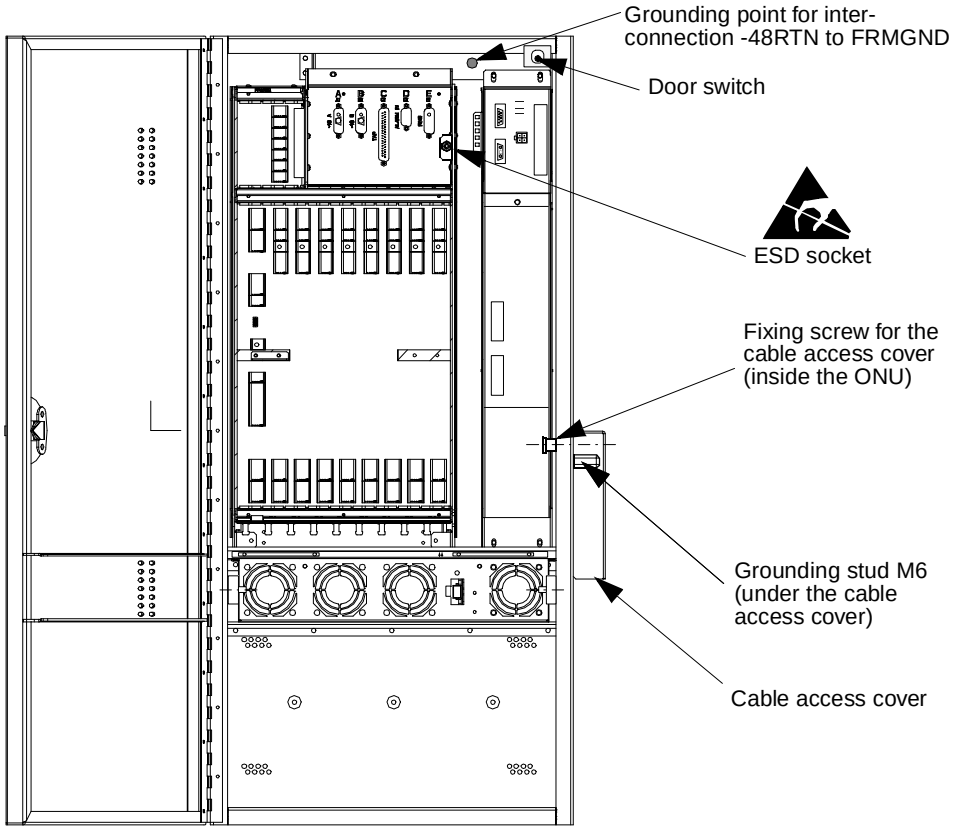

Grounding point for inter-connection -48RTN to FRMGND
Door switch
ESD socket
Fixing screw for the cable access cover (inside the ONU)
Grounding stud M6 (under the cable access cover)
Cable access cover

Figure 4-2 Earthing and grounding points and door switch of the ONU

4.3.2 Earthing

The approved earth electrode must be connected by the installer to the M6 earthing stud.

For earthing procedure and the parts of the earthing stud see Figure 5-9, page 5-24.

4.3.3 Door intrusion switch

The door switch is located on the upper right corner of the ONU housing.

The switch is factory cabled to the blade terminals E2, E3 on the rectifier back-plane. The switch is cabled to issue an alarm as long as the door is open (using the NC contact (break)).

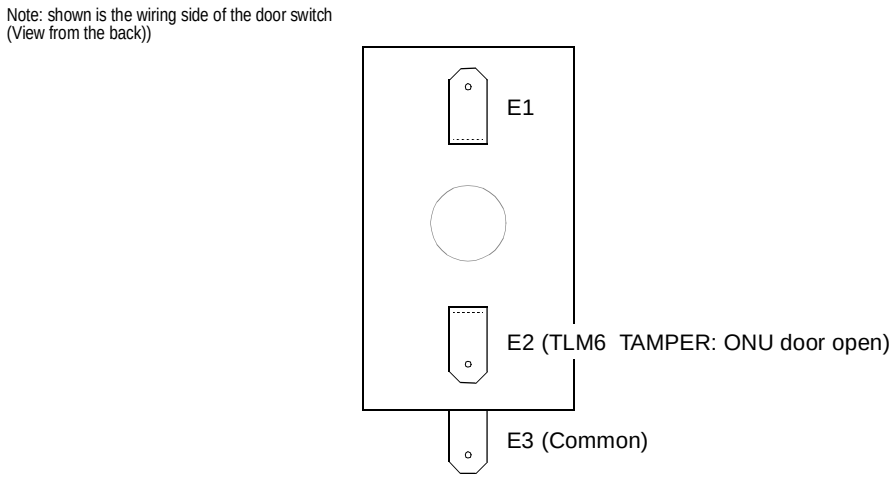


Figure 4-3 Terminal arrangement of the ONU door switch

The alarming can be changed to issue an alarm as long as the door is closed when the wire of the middle door switch contact (E2) is connected to the upper door switch contact (E1) instead.

4.4 Pinning of connectors and connecting points of the ONU Subshelf

The figure below shows the connector arrangement of the ONU Subshelf.

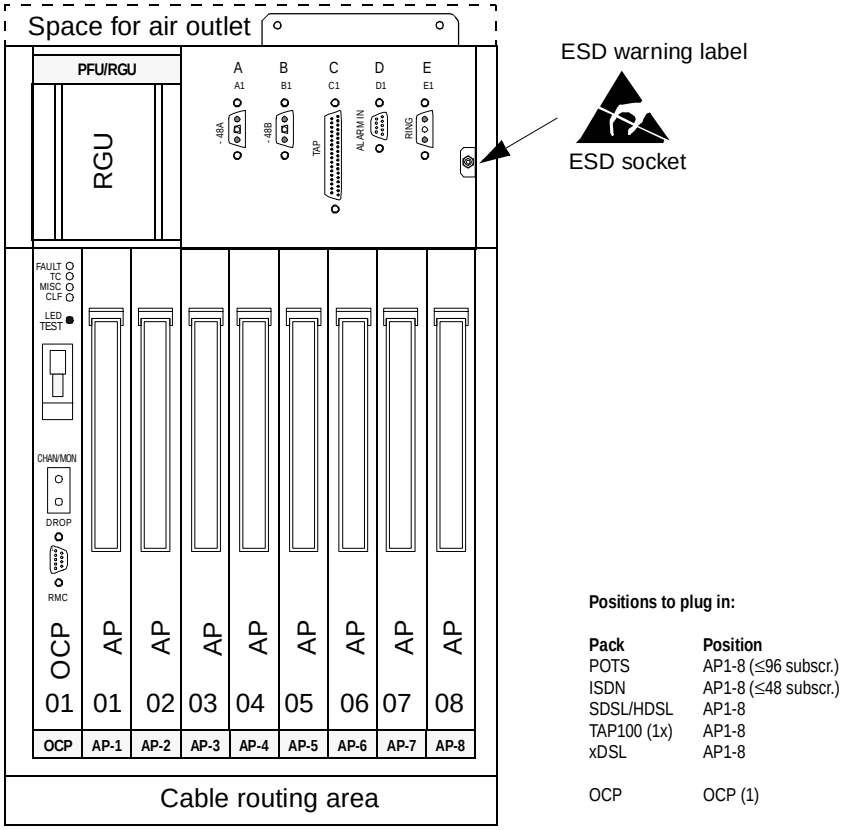


Figure 4-4 Pack arrangement and connector arrangement of the ONU Subshelf

4.4.1 Connectors of the ONU Subshelf connection panel (SCP)

The figure below shows all connector positions of the ONU Subshelf connection panel (SCP).

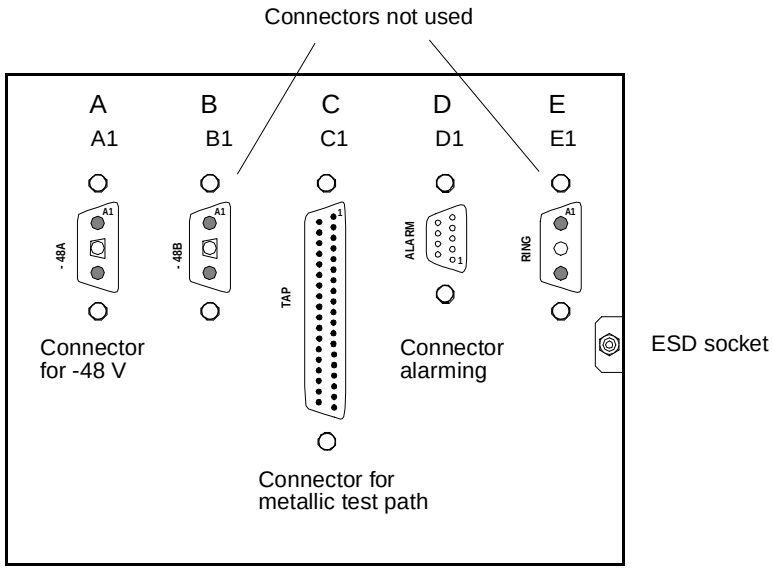


Figure 4-5 Connector arrangement of the ONU Subshelf connection panel (SCP)

4.4.1.1 Power connectors A1 (-48A), B1 (-48B)

Connector A1

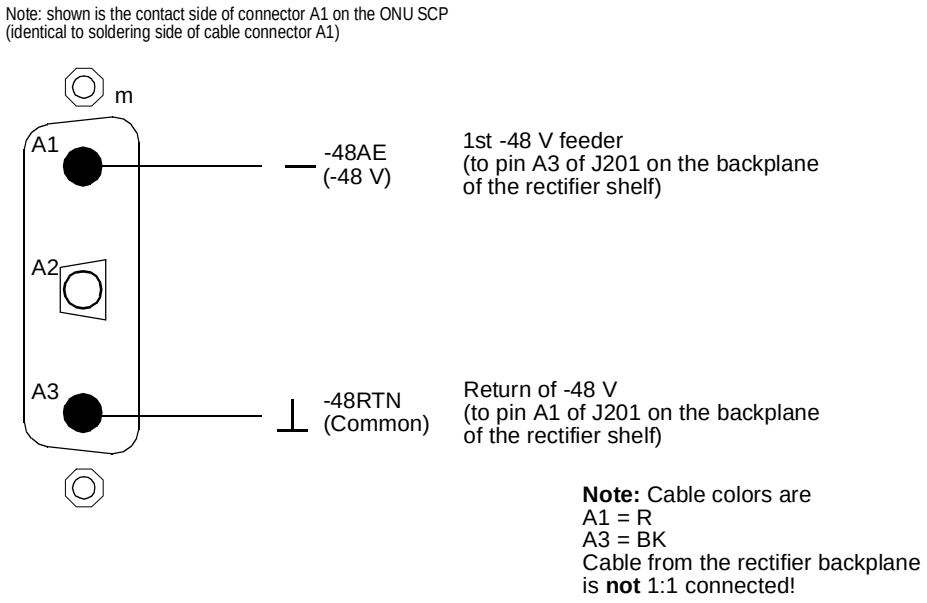


Figure 4-6 Power supply connector A1 pin assignment (1st -48 V power feeder)

Connector B1

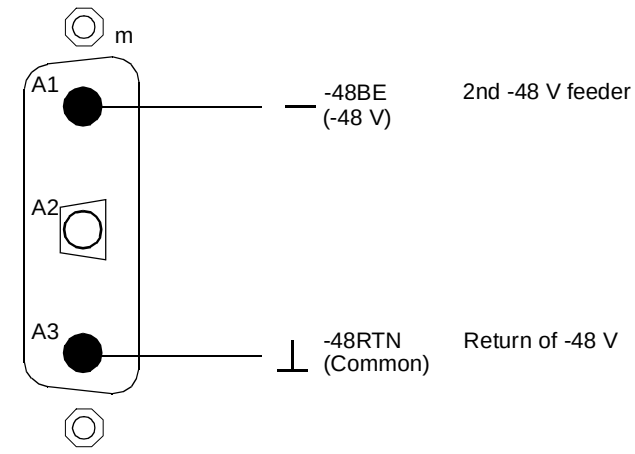
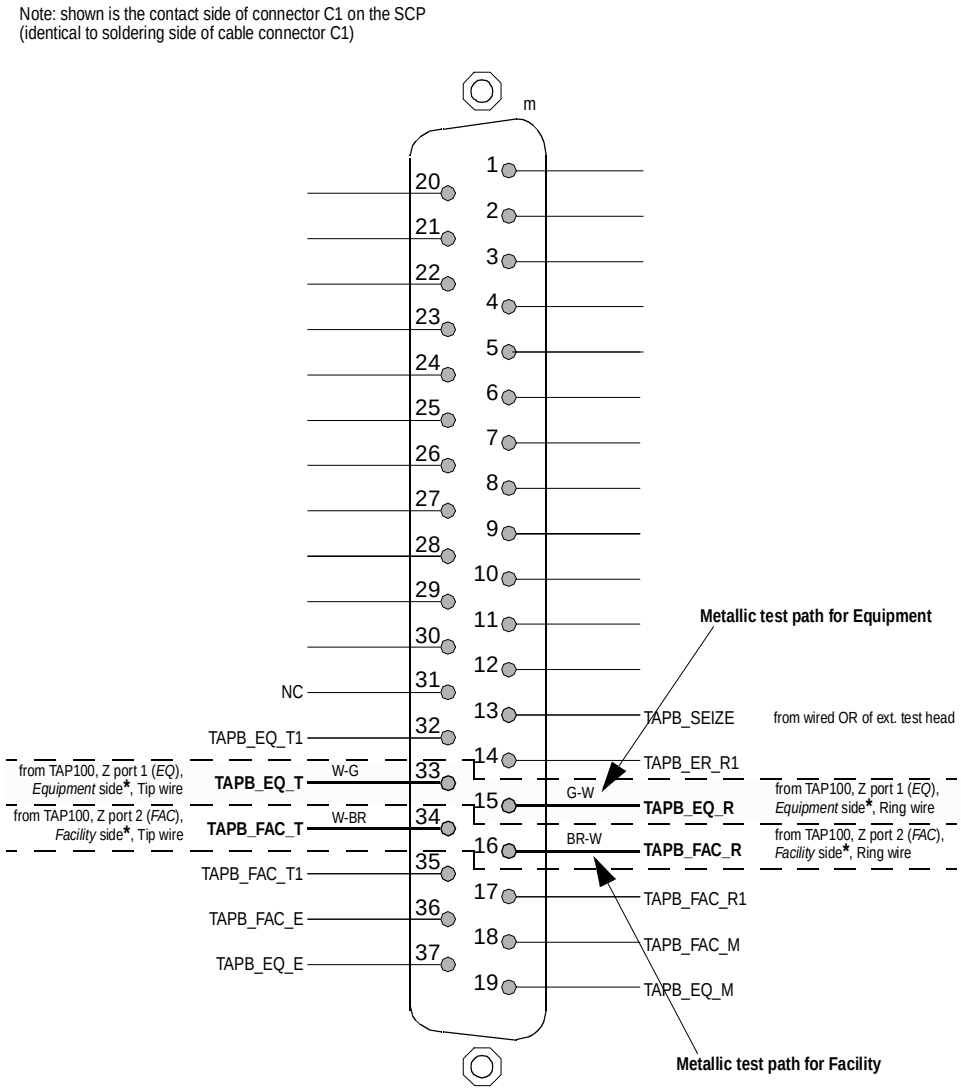


Figure 4-7 Power supply connector B1 pin assignment (2nd -48 V power feeder)

4.4.1.2 TAP connector C1 (TAP)

Connector C1



*** Note:** *AnyMedia* specifies: Equipment (EQ) as testingthe subscriber side;
Facility (FAC) as testing the switching side (AP port side).
Cable colors valid for the ED7C818-36 Gr1, ...1A, ...1B, ...1C cable.

Figure 4-8 Pinning of TAP connector C1

For the crosswiring see Table 6-4, page 6-24.

4.4.1.3 Alarm-in connector D1 (ALARM)

Connector D1

Note: shown is the contact side of connector D1 on the ONU Subshelf connection panel (identical to soldering side of cable connector D1)

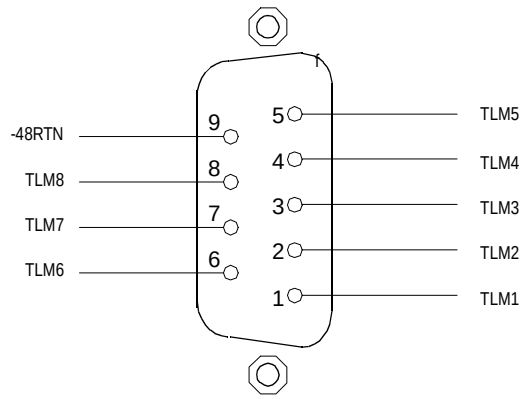


Figure 4-9 Pinning of the alarm-in connector D1

NOTE:
All the TLM alarm inputs are provisionable for the alarm severities Major (MJ) and Minor (MN) and Critical (CR). All TLM alarm inputs must be provisioned during turn-up; for recommended settings for the AC-powered rack, see Table 2-4, page 2-17.

Internal cable connections are:

Table 4-3 Alarm connections of the ONU for indoor applications

Cable conn. J202 (from female J202 on the backplane of the rectifier shelf)	***AnyMedia* signal**	**Wire color**	**Alarm meaning**
1	TLM1	BL-W	Battery Cell Failure (BCF)
2	TLM2	O-W	Power Rectifier Failure (PRF)
3	TLM3	G-W	ACF: AC Mains Failure
4	TLM4	BR-W	BD: Battery on Discharge
5	TLM5	S-W	FAN: 7A Fan Unit Failure
6	TLM6	W-BL	TAMPER: ONU Door Open
7	TLM7	W-O	MJF: Major Fuse Alarm (Monitoring)
8	TLM8	W-G	not used (provided for future use: Monitoring AC mains)
9	-48RTN/GND	W-BR	Alarm Common

4.4.1.4 Ringing connector E1 (RING)

ConnectorE1

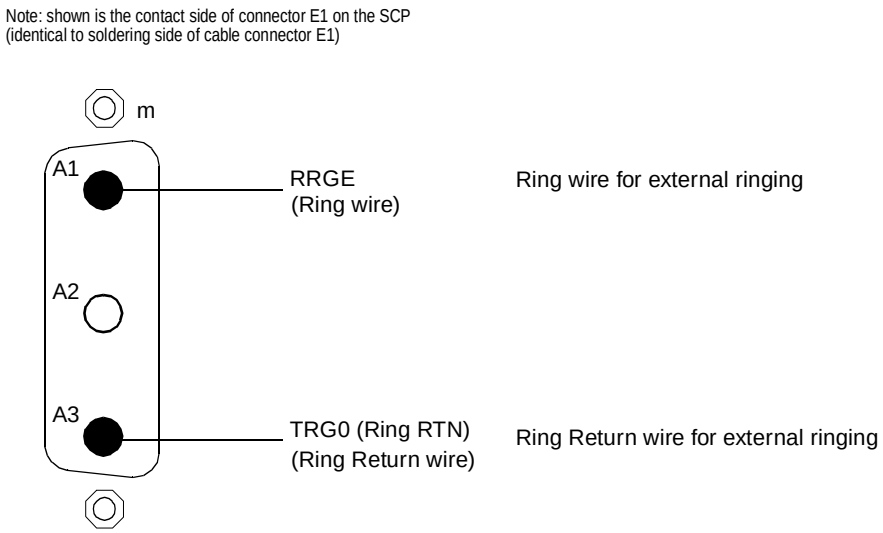


Figure 4-10 Ringing connector E1 pin assignment

4.4.2 Connecting points of the ONU Subshelf backplane

On the backplane of the ONU Subshelf the ONU Subshelf identifier and if required the powering and the ringing variant can be adjusted.

The following chapter shows the positions of the parts required for adjusting the ONU Subshelf identifier and changing the powering/ringing variant.

Addressing

Each ONU must have its own subshelf address between 1 to 8, different for each subshelf connected to the *AnyMedia* Mainshelf via the optical link.

Inventory

For inventory data the backplane is factory equipped with two resistors representing the inventory data.

Powering and ringing

For standard applications the ONU Subshelf is delivered for internal -48 V-powering via the built-in rectifier which is fed by AC mains and buffered by 4 batteries. Also for standard applications the internal ringing generator is used in the ONU Subshelf.

NOTE:
For standard applications the powering and ringing variant must not be changed.

Powering and ringing for future use

Only for special purposes on the back of the backplane two bridges must be changed for different powering and ringing. To change these two bridges the ONU Subshelf must be removed and also the cover on the back of the ONU Subshelf must be removed.

NOTE:
This procedure has to be carried out before the cabling starts.

4.4.2.1 Backplane connector designations

The following figure shows the location of:

- the DIP switch for ONU addressing (ONU Subshelf identifier)
- the two "inventory resistors" (0Ω-resistor, factory equipped, no change possible).

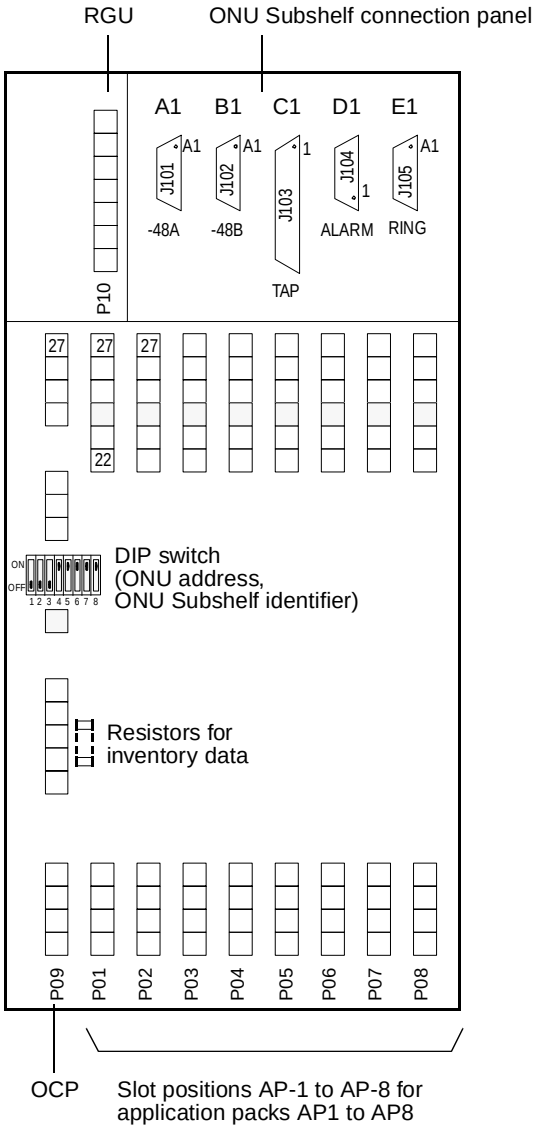


Figure 4-11 ONU backplane arrangement as viewed from front (no pack inserted)

The following table lists all backplane connectors and the DIP switch of the ONU Subshelf.

Table 4-4 ONU Subshelf backplane connectors

Backplane designation	Connector type	Description	Shelf connection panel designation
J101	2-pin male D-sub	-48AE (1st power feeder)	A1
J102	2-pin male D-sub	-48BE (2nd power feeder)	B1
J103	37-pin male D-sub	TAP connector	C1
J104	9-pin female D-sub	Miscellaneous alarm inputs	D1
J105	2-pin male D-sub	Ringing with TRG0, RRGE	E1
P01 to P08	Metral Header (24x5) + (12x4) + Guide pin + (18x4)	Application pack AP1 to AP8	-
P09	Metral Header (24x5) + (30x5) + Guide pin + (18x5) + (24x5)	Optical controller pack (OCP)	-
P10	Metral Header (42x5)	Ringing generator unit (RGU) or Power filter unit (PFU)	-
D1	DIP Switch (8-fold)	ONU Subshelf identifier (binary coded, inverted)	-

4.4.2.2 Inventory headers for backplane release

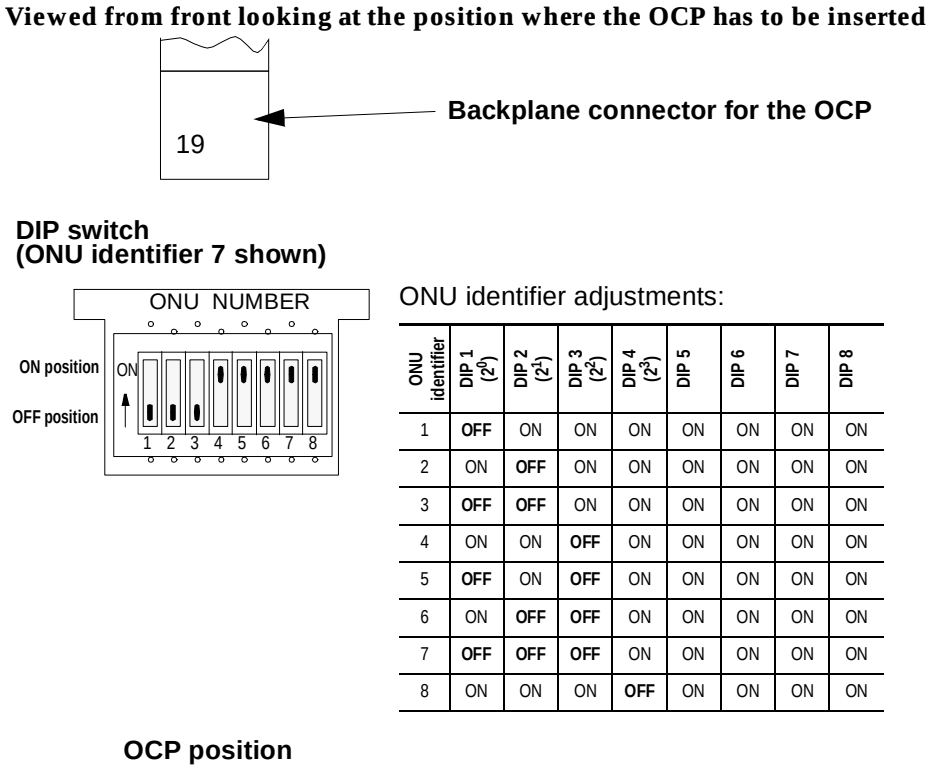
The backplane inventory data is factory set to the fixed value of 9 via two resistors on the backplane. This value cannot be changed.

4.4.2.3 Eightfold DIP switch for ONU addressing

For the ONU addressing a DIP switch with 8 switches is located on the backplane of the ONU Subshelf in the position where the OCP has to be inserted. The DIP switch is front accessible as long as the OCP and the first 4 APs (AP1 to AP4) are not inserted. Each ONU must have its own ONU Subshelf identifier (ONU address) which must correspond to the AID subsh-{1-8} entered with the TL1 command ENT-SUBSHELF.

The switches are inverse binary coded.

The following figure shows the location of the DIP switch and the adjustments for the ONU Subshelf identifiers 1 to 8.



ONU identifier adjustments:

ONU identifier	DIP 1 (2^0)	DIP 2 (2^1)	DIP 3 (2^2)	DIP 4 (2^3)	DIP 5	DIP 6	DIP 7	DIP 8
1	**OFF**	ON	ON	ON	ON	ON	ON	ON
2	ON	**OFF**	ON	ON	ON	ON	ON	ON
3	**OFF**	**OFF**	ON	ON	ON	ON	ON	ON
4	ON	ON	**OFF**	ON	ON	ON	ON	ON
5	**OFF**	ON	**OFF**	ON	ON	ON	ON	ON
6	ON	**OFF**	**OFF**	ON	ON	ON	ON	ON
7	**OFF**	**OFF**	**OFF**	ON	ON	ON	ON	ON
8	ON	ON	ON	**OFF**	ON	ON	ON	ON

Figure 4-12 DIP switch for ONU addressing (on the OCP position)

4.5 Connectors of the packs for the ONU Subshelf

The following chapter details the connector information for the packs which can be inserted into the ONU Subshelf.

4.5.1 OCP pack

The OCP is equipped with the RMC connector to connect to the PC GSI and with the CHAN/MON DROP connector for testing/monitoring.

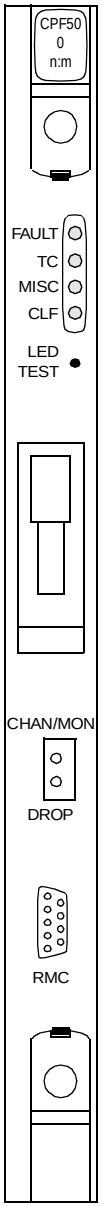
For connecting the fiber an SC-type connector is used.

NOTE:
The OCP does **not** have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered.

NOTE:
The OCP (CPF500) may only be used with the Comcode 108741265., this is Issue 2:3.

4.5.1.1 Faceplate of the OCP

Faceplate



○ **LED**
● **Button**

LED indicators on the OCP faceplate

LED	Function	Color
FAULT	Pack out of order (Error) Lit when a fault is detected on the OCP Flashes at a rate of approximately 1 Hz when the pack executes built-in self-tests	Red
TC	Lit when metallic test access is provided at TAP-B interface	Green
MISC	Lit when one of the eight miscellanous alarm closure inputs is active because of an alarm condition	Yellow
CLF	Carrier Line Failure Lit when a fault or facility alarm occurs on the optical link	Yellow

Jacks and connectors on the OCP faceplate

Connector / jack	Function
SC-type fiber connector for optical link	Provides connection between the optical link and the optical link interface of the OCP
CHAN/MON	Provides full-splitting access to the channel side (toward the Z ports of the APs); also provides bridging access (monitoring mode) to listen in to an existing call
DROP	Provides full-splitting access to the drop side (toward the drop and subscriber equipment)
RMC	Enables craft personnel to connect remotely to the COMDAC via a GSI if the optical link is working; allows remote test access using a standard login procedure

Figure 4-13 OCP faceplate

The table below shows the transmit/receive parameters for the laser transmitter/receiver of the OCP which are identical to the parameters of the OAP inside the *AnyMedia* Mainshelf.

Table 4-5 Parameters for the laser receiver/transmitter of the OAP

Optical parameters:	**Value, remark**
Laser type	Laser transmitter of Laser Class I
Wavelength	1310 ±50 nm (upstream); 1550 ±50 nm (downstream)
Fiber	Single-mode, bidirectional (wavelength division multiplexing)
Connector type	Single connector, SC-type
Optical link range	about 15 km at least (or about 30 km for fibers with 0.4 dBm/km without splice/connectors ...)
Optical laser transmit average power	- 8 dBm min., ± 2 dBm max
Optical receive sensitivity	- 23.5 dBm or better, with 12 dB loss budget, including fiber, connectors, splices
Reflection	max. -20 dBm
Bit error rate (BER)	$\leq 1x10^{-10}$
Automatic laser shutdown (ALS)	No

4.5.1.2 CHAN/MON DROP connector

Connector CHAN/MON DROP

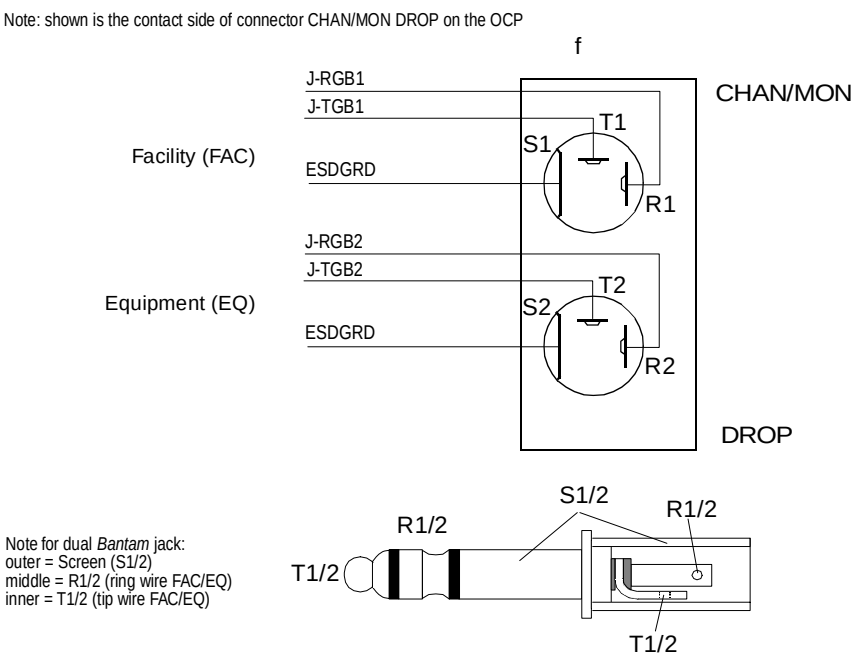


Figure 4-14 CHAN/MON DROP connector of the OCP

4.5.1.3 RS-232C connector (RMC)

Connector RMC

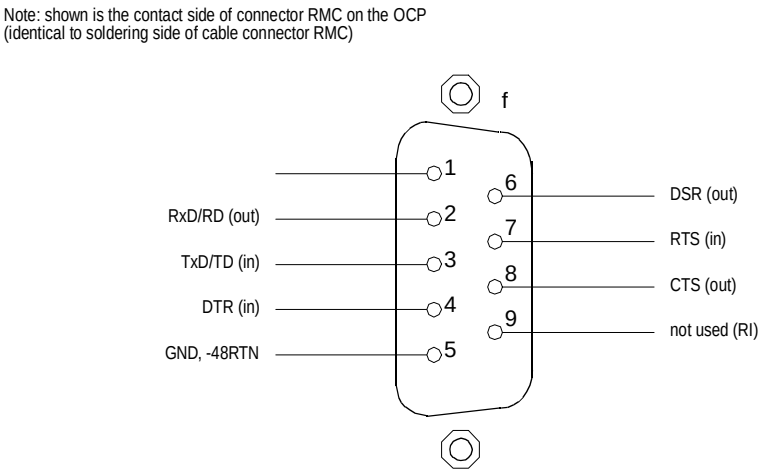


Figure 4-15 RMC connector on the OCP

Connector RMC to PC GSI locally

The internal cable connections for connecting the PC GSI locally to the OCP are:

Table 4-6 RS-232C cable: ONU Subshelf, connector RMC on OCP to PC GSI, COM1/COM2

Male conn. RMC (DCE mode) (from female RMC on OCP)	***AnyMedia* signal for RS-232C**	**Wire**	**Female conn. COM1/COM2 (DTE mode)**[a] (from male COM1/2 on PC GSI)	
9-pin			**9-pin**	**25-pin**
1 (internally not used)	DCD / CD (in)		1	8
2	RxD / RD (out)		2	3
3	TxD / TD (in)		3	2
4	DTR (in)		4	20
5	Signal Ground		5	7
6	DSR (out)		6	6
7	RTS (in)		7	4
8	CTS (out)		8	5
9	not used (RI)			22 not used

a Before making the cable the type of connector used must be checked (9-/25-pin, male/female). Depending on the PC used the connector type can differ from the type stated above. When using PPP or "Multiple NE mode" the bridge DCD-DSR may be required depending on the PC used.

4.5.2 Application packs

Application pack connectors as furnished on factory equipment are of the insulation displacement (ID) type.

4.5.2.1 Use of application pack connectors

The 68-pin cable connectors of the APs and the a/b-cables are uniformly built up and connected. Each AP uses the same uniformly constructed cable with 32 twisted pair wires connected to 64 pins of the cable connector. The lower opposite pins 1 and 35 and the upper opposite pins 33 and 68 are shorted to check that the connector is connected. Only the number of Tip/Ring wires used differs per AP. For the ADSL4 AP (LPA400) for example ports 1, 3, 5, and 7 are the ADSL ports to the customer via MDF. Ports 2, 4, 6, and 8 are connected to the switch-side a/b wires (POTS) which have to be routed to the customer over the ADSL signal.

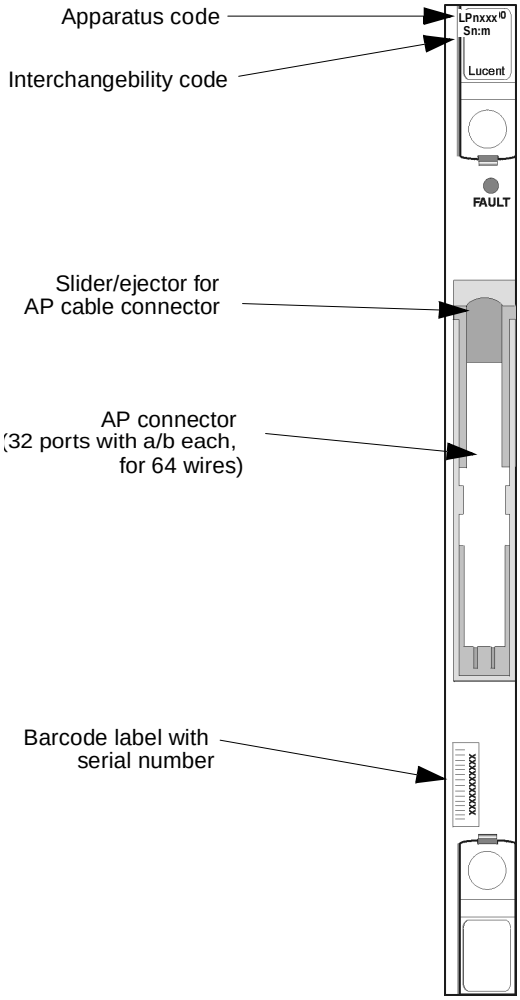
How to connect or disconnect an a/b-connector can be seen in Figure 6-2, page 6-5.

The shielding of a/b cables can be found in Figure 6-3, page 6-6.

NOTE:
For the application packs LPS501 and LPS503 (HDSL APs) a sealing current of 2 mA is provisionable for all ports per AP avoiding corrosion prob-

lems of wires which are only connected mechanically (for example wires which are drilled together only).

4.5.2.2 Faceplate of APs



LED	Function	Color
FAULT	Pack out of order (Error) Lit when a fault is detected on the pack. Flashes at a rate of approximately 1 Hz during pack initialization (built-in self-test).	Red
CLF	Carrier Line Failure Lit when a fault or facility alarm occurs on the optical link	Yellow

Note: For the AP POTS (LPZ100C) 32 Z ports are used, no wire is unused.
For the AP Periodic Pulse Metering (LPP100B) 24 Z ports are used, 16 wires are unused.
For the Metallic Test Pack (TAP100) 2 ports are used, 60 wires are unused.
For the ISDN APs (LPU112/LPU430) 12/16 ports are used, 40/32 wires are unused.
For the ADSL4p AP (LPA400/LPA400B) 8 ports are used, 48 wires are unused.
For the ADSL8p AP (LPA408) 16 ports are used, 32 wires are unused.
For the ADSL16p AP (LPA416) 32 ports are used, 32 wires are unused.
For the ADSL4i AP (LPA414) 8 ports are used, 48 wires are unused.
For the ADSL16i AP (LPA414) 32 ports are used, no wire is unused.
For the HDSL APs (LPS501/LPS503) 4 ports are used, 56 wires are unused.
For the SHDSL AP (LPS510) 8 ports are used, 48 wires are unused.
For the SDSL AP (LPS716) 16 ports are used, 32 wires are unused

Figure 4-16 Application pack faceplate (except the OCP, SHDSL AP)

NOTE:
Four pins on this 68-pin connector are shorted so that the *AnyMedia* Access System can verify whether an application pack cable is connected or not.

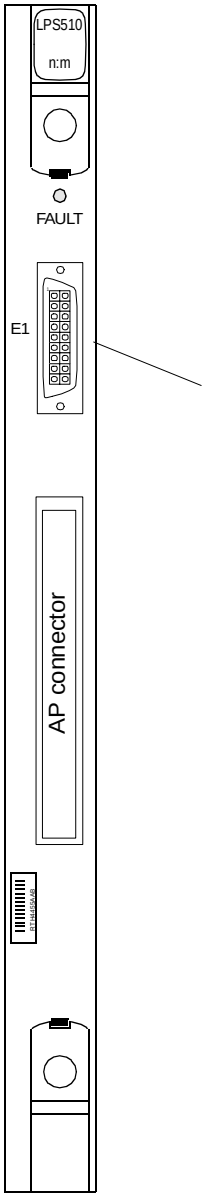
4.5.2.3 Faceplate of the single pair high bit rate DSL AP

The LPS510 is an 8 port SHDSL AP which provides 8 SHDSL ports each supporting the ETSI SDSL and ITU-T G.shdsl standards.

The LPS510 can additionally provide four 2.048Mbit/s 120 Ω balanced G.703 ports used which are normally not used for ONU applications (These E1 ports in are used in the *AnyMedia* Mainshelf for unstructured E1 to SHDSL conversion of leased lines - or other E1 services - from an SDH Add Drop Multiplexer - or other equipment providing E1 services. The E1 ports are intended for unstructured operation only and preserve E1 clocking). The faceplate is equipped with the additional 20-pin female AMP connector for the 4 E1 ports (upstream/downstream each), see the figure below.

NOTE:
For the application pack LPS510 (SHDSL AP) a sealing current of 400 µA is provisionable for all ports per AP avoiding corrosion problems of wires which are only connected mechanically (for example wires which are drilled together only).

Faceplate of the SHDSL AP



LED

LED	Function	Color
FAULT	Pack out of order (Error) Lit when a fault is detected on the pack. Flashes at a rate of approximately 1 Hz during pack initialization (built-in self-test).	Red

E1 connector for 4 E1 ports
(impedance 120 Ω, 4 E1 feeder Upstream/Downstream each for the ONU normally not used)

Figure 4-17 SHDSL AP LPS510 faceplate

4.5.2.4 POTS application pack connector

POTS AP connector

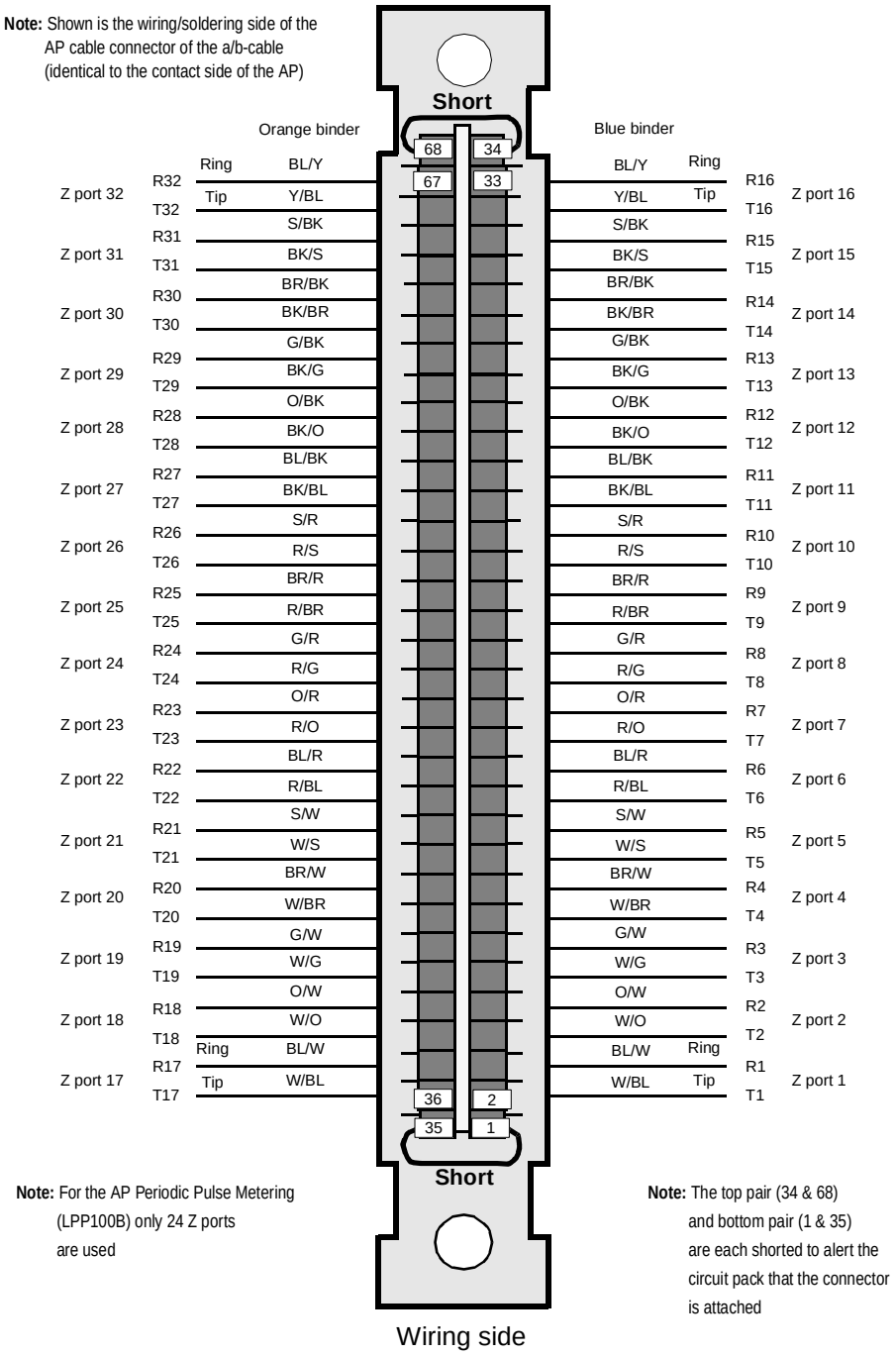


Figure 4-18 Pinning of the POTS AP connectors

The connector is used for a/b-cables of application packs (LPZ100/LPP100/LPZ12xB) in positions AP-1 to AP-8.

4.5.2.5 Test application pack connector

TAP100 connector

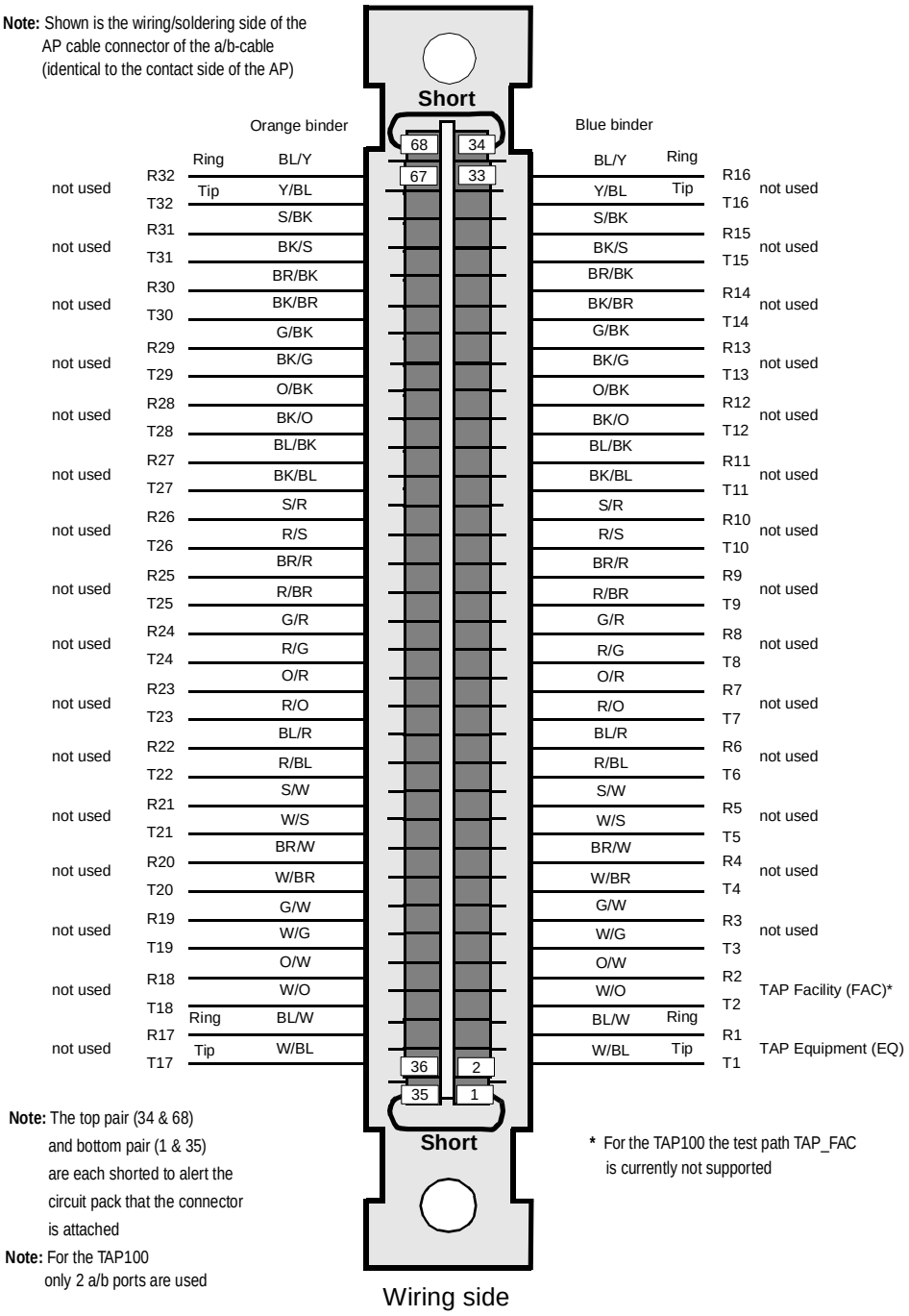

Note: Shown is the wiring/soldering side of the AP cable connector of the a/b-cable (identical to the contact side of the AP)
Short
Orange binder
Blue binder
68
34
67
33
36
2
35
1
Short
Wiring side
Note: The top pair (34 & 68) and bottom pair (1 & 35) are each shorted to alert the circuit pack that the connector is attached
Note: For the TAP100 only 2 a/b ports are used
* For the TAP100 the test path TAP_FAC is currently not supported
not used R32 Ring BL/Y
not used T32 Tip Y/BL
not used R31 S/BK
not used T31 BK/S
not used R30 BR/BK
not used T30 BK/BR
not used R29 G/BK
not used T29 BK/G
not used R28 O/BK
not used T28 BK/O
not used R27 BL/BK
not used T27 BK/BL
not used R26 S/R
not used T26 R/S
not used R25 BR/R
not used T25 R/BR
not used R24 G/R
not used T24 R/G
not used R23 O/R
not used T23 R/O
not used R22 BL/R
not used T22 R/BL
not used R21 S/W
not used T21 W/S
not used R20 BR/W
not used T20 W/BR
not used R19 G/W
not used T19 W/G
not used R18 O/W
not used T18 W/O
not used R17 Ring BL/W
not used T17 Tip W/BL
BL/Y Ring R16 not used
Y/BL Tip T16
S/BK R15 not used
BK/S T15
BR/BK R14 not used
BK/BR T14
G/BK R13 not used
BK/G T13
O/BK R12 not used
BK/O T12
BL/BK R11 not used
BK/BL T11
S/R R10 not used
R/S T10
BR/R R9 not used
R/BR T9
G/R R8 not used
R/G T8
O/R R7 not used
R/O T7
BL/R R6 not used
R/BL T6
S/W R5 not used
W/S T5
BR/W R4 not used
W/BR T4
G/W R3 not used
W/G T3
O/W R2 TAP Facility (FAC)*
W/O T2
BL/W Ring R1 TAP Equipment (EQ)
W/BL Tip T1

Figure 4-19 Pinning of TAP100 connector

The connector is used for the TAP100 cable of the metallic test application pack (TAP100) in one of the positions AP-1 to AP-8.

4.5.2.6 ISDN application pack connector

ISDN AP connector

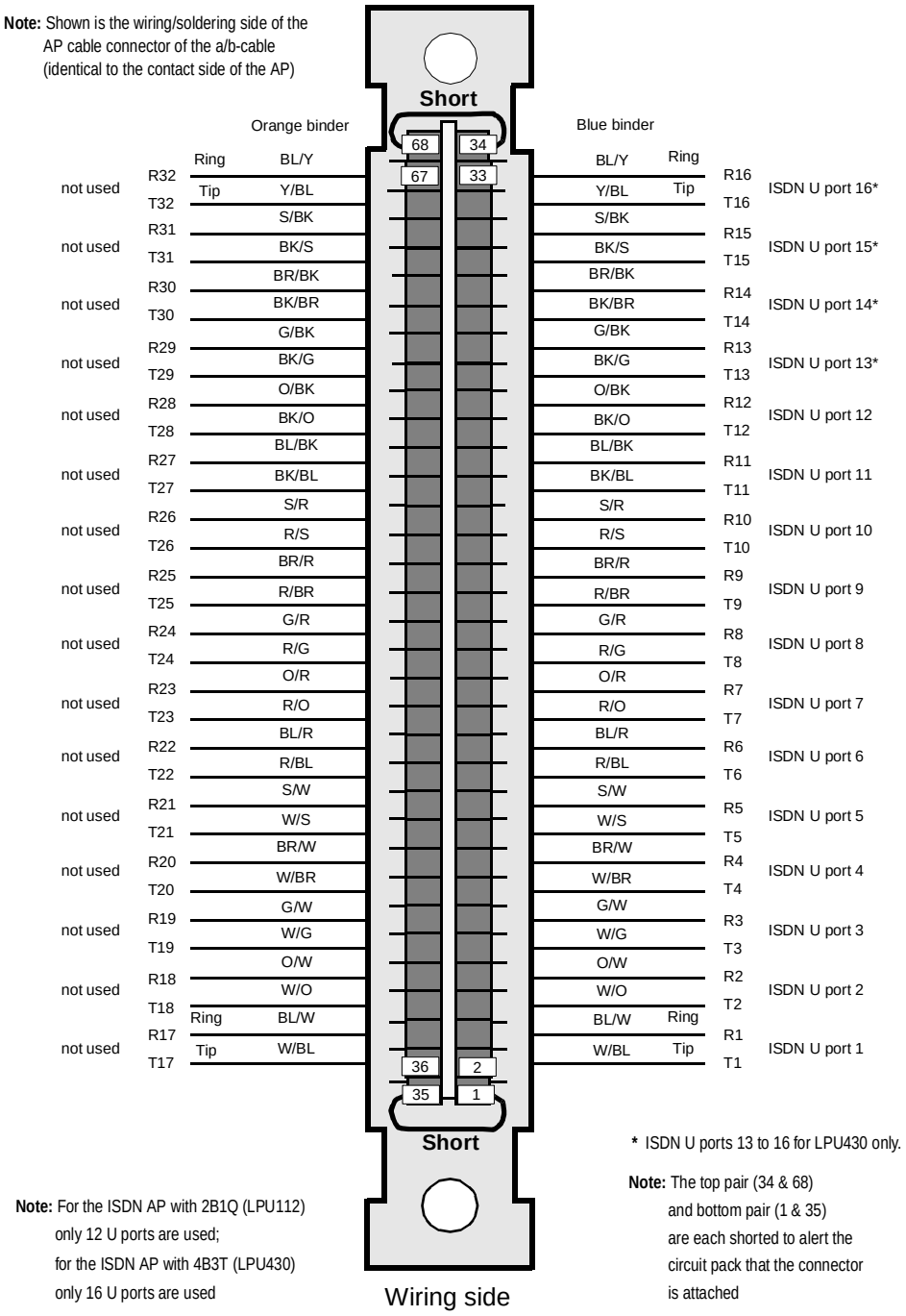


Figure 4-20 Pinning of ISDN connectors

The connector is used for ISDN cables of ISDN application packs (LPU112/LPU430) in positions AP-1 to AP-8.

4.5.2.7 xDSL application pack connector

ADSL4p connector for 4 ADSL /4 POTS splitter

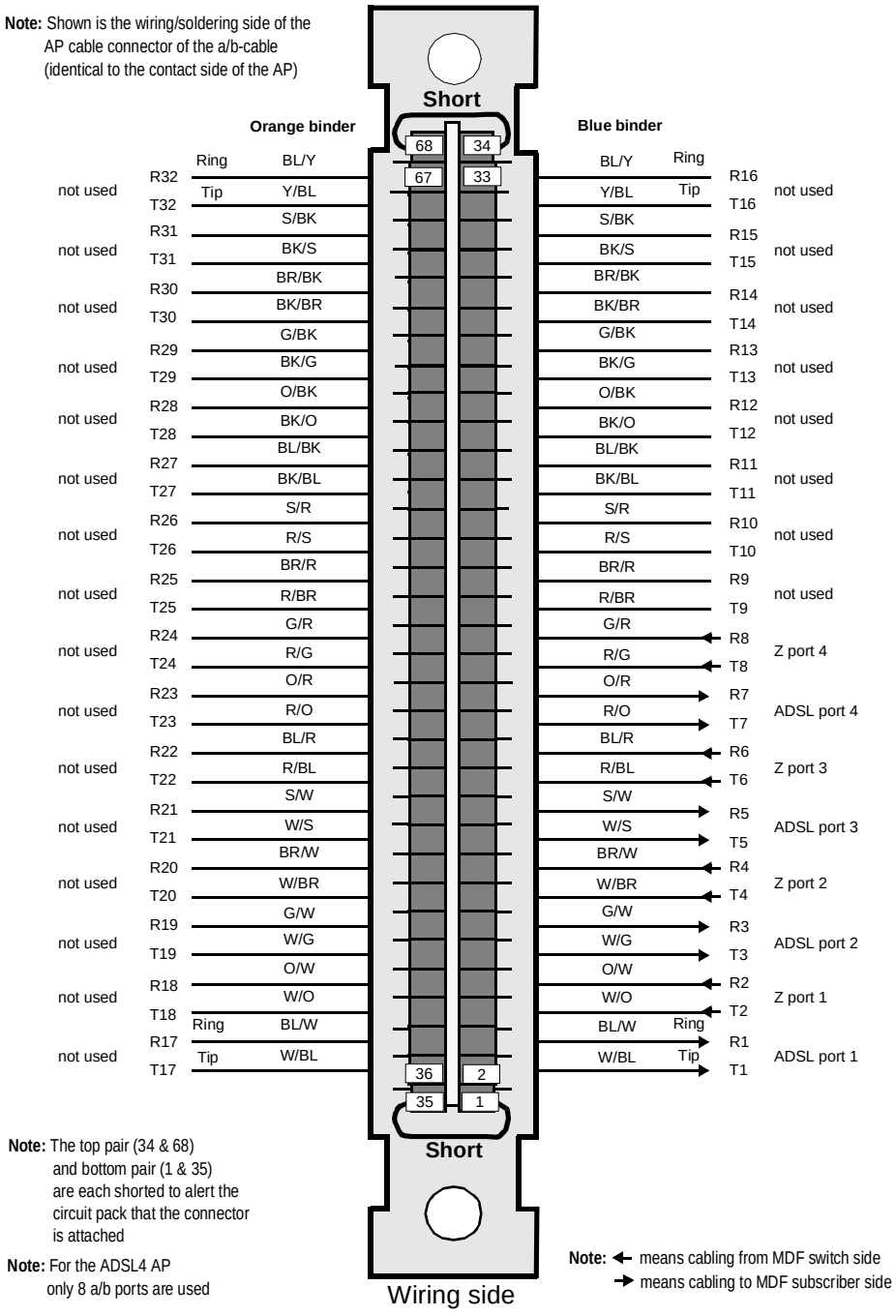

Note: Shown is the wiring/soldering side of the AP cable connector of the a/b-cable (identical to the contact side of the AP)
Short
Orange binder
Blue binder
68
34
67
33
not used R32 Ring BL/Y
not used T32 Tip Y/BL
not used R31 S/BK
not used T31 BK/S
not used R30 BR/BK
not used T30 BK/BR
not used R29 G/BK
not used T29 BK/G
not used R28 O/BK
not used T28 BK/O
not used R27 BL/BK
not used T27 BK/BL
not used R26 S/R
not used T26 R/S
not used R25 BR/R
not used T25 R/BR
not used R24 G/R
not used T24 R/G
not used R23 O/R
not used T23 R/O
not used R22 BL/R
not used T22 R/BL
not used R21 S/W
not used T21 W/S
not used R20 BR/W
not used T20 W/BR
not used R19 G/W
not used T19 W/G
not used R18 O/W
not used T18 W/O
not used R17 Ring BL/W
not used T17 Tip W/BL
BL/Y Ring R16 not used
Y/BL Tip T16 not used
S/BK R15
BK/S T15 not used
BR/BK R14
BK/BR T14 not used
G/BK R13
BK/G T13 not used
O/BK R12
BK/O T12 not used
BL/BK R11
BK/BL T11 not used
S/R R10
R/S T10 not used
BR/R R9
R/BR T9 not used
G/R R8 Z port 4
R/G T8
O/R R7 ADSL port 4
R/O T7
BL/R R6 Z port 3
R/BL T6
S/W R5 ADSL port 3
W/S T5
BR/W R4 Z port 2
W/BR T4
G/W R3 ADSL port 2
W/G T3
O/W R2 Z port 1
W/O T2
BL/W Ring R1 ADSL port 1
W/BL Tip T1
36
2
35
1
Short
Note: The top pair (34 & 68) and bottom pair (1 & 35) are each shorted to alert the circuit pack that the connector is attached
Note: For the ADSL4 AP only 8 a/b ports are used
Note: ← means cabling from MDF switch side
→ means cabling to MDF subscriber side
Wiring side

Figure 4-21 Pinning of ADSL connector (4 ADSL ports / 4 POTS splitter)

The connector is used for ADSL cables of ADSL-4 application pack (LPA400/LPA400B) in positions AP-1 to AP-8.

ADSL8p connector for 8 ADSL /8 POTS splitter

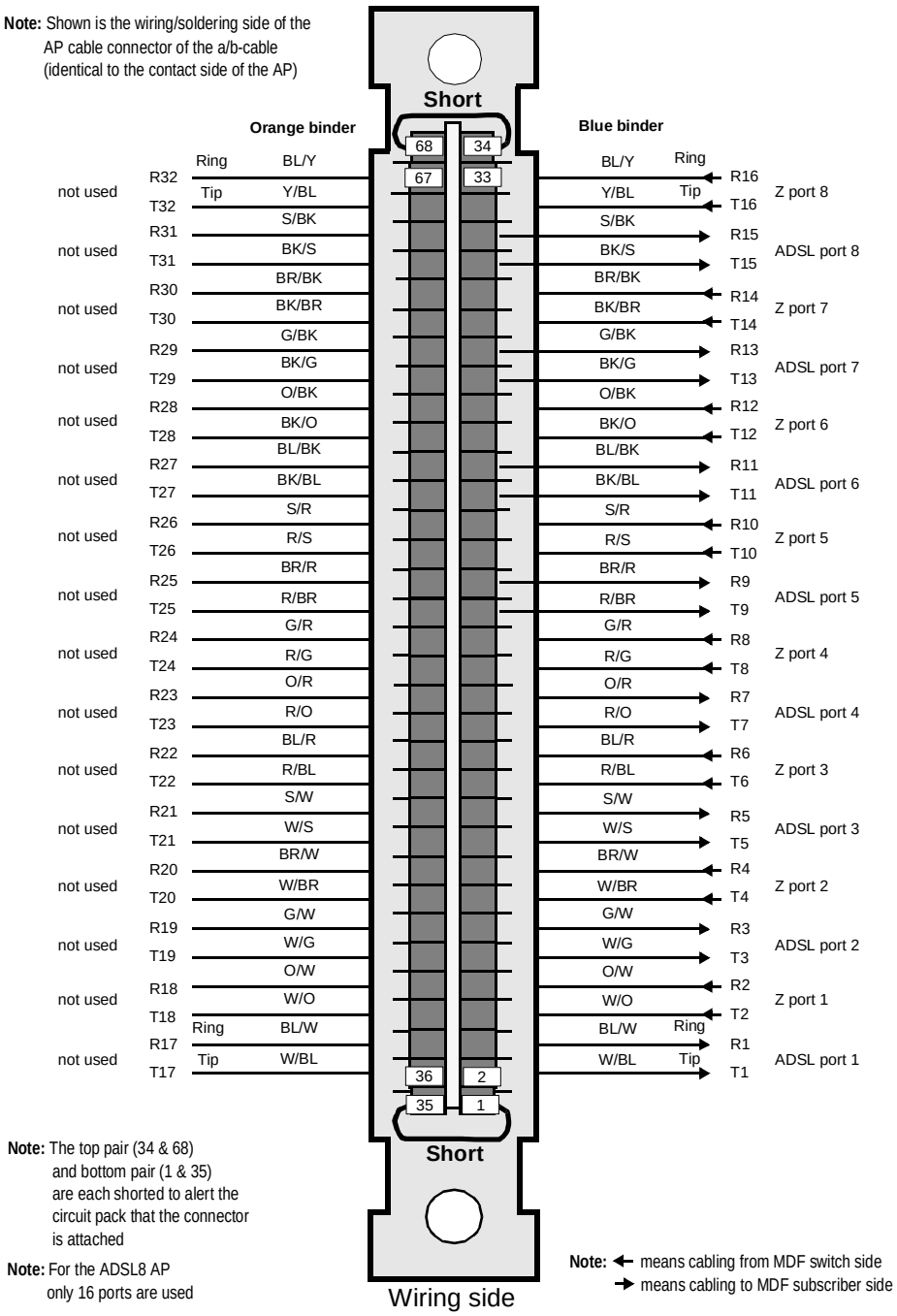


Figure 4-22 Pinning of ADSL connector (8 ADSL ports / 8 POTS splitter)

The connector is used for ADSL cables of ADSL8p application pack (LPA408) in positions AP-1 to AP-8.

ADSL16p connector for 16 ADSL /16 POTS splitter

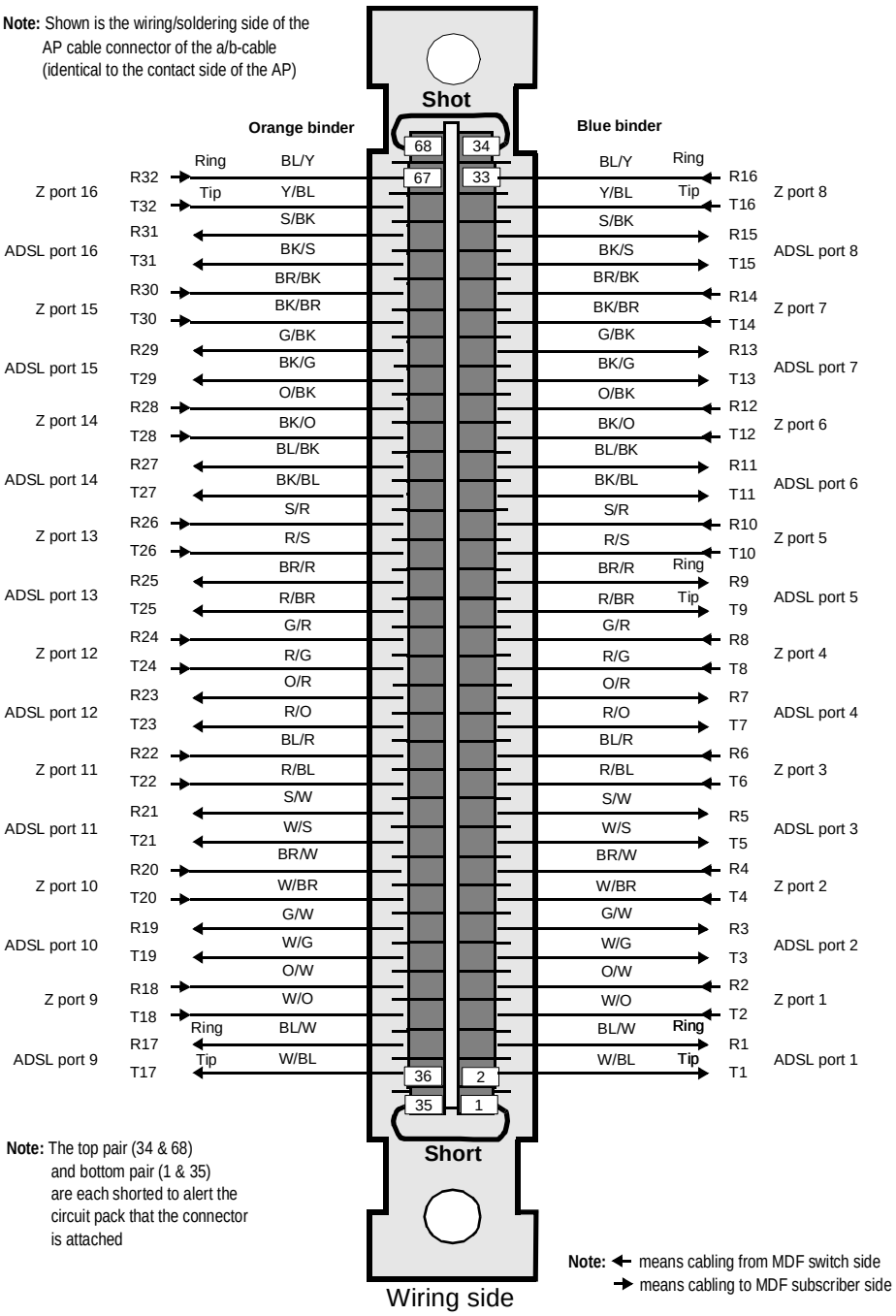


Figure 4-23 Pinning of ADSL connector (16 ADSL ports / 16 POTS splitter)

The connector is used for ADSL cables of ADSL16p application pack (LPA416/LPA419) in positions AP-1 to AP-8.

ADSL4i connector for 4 ADSL/4 ISDN splitter

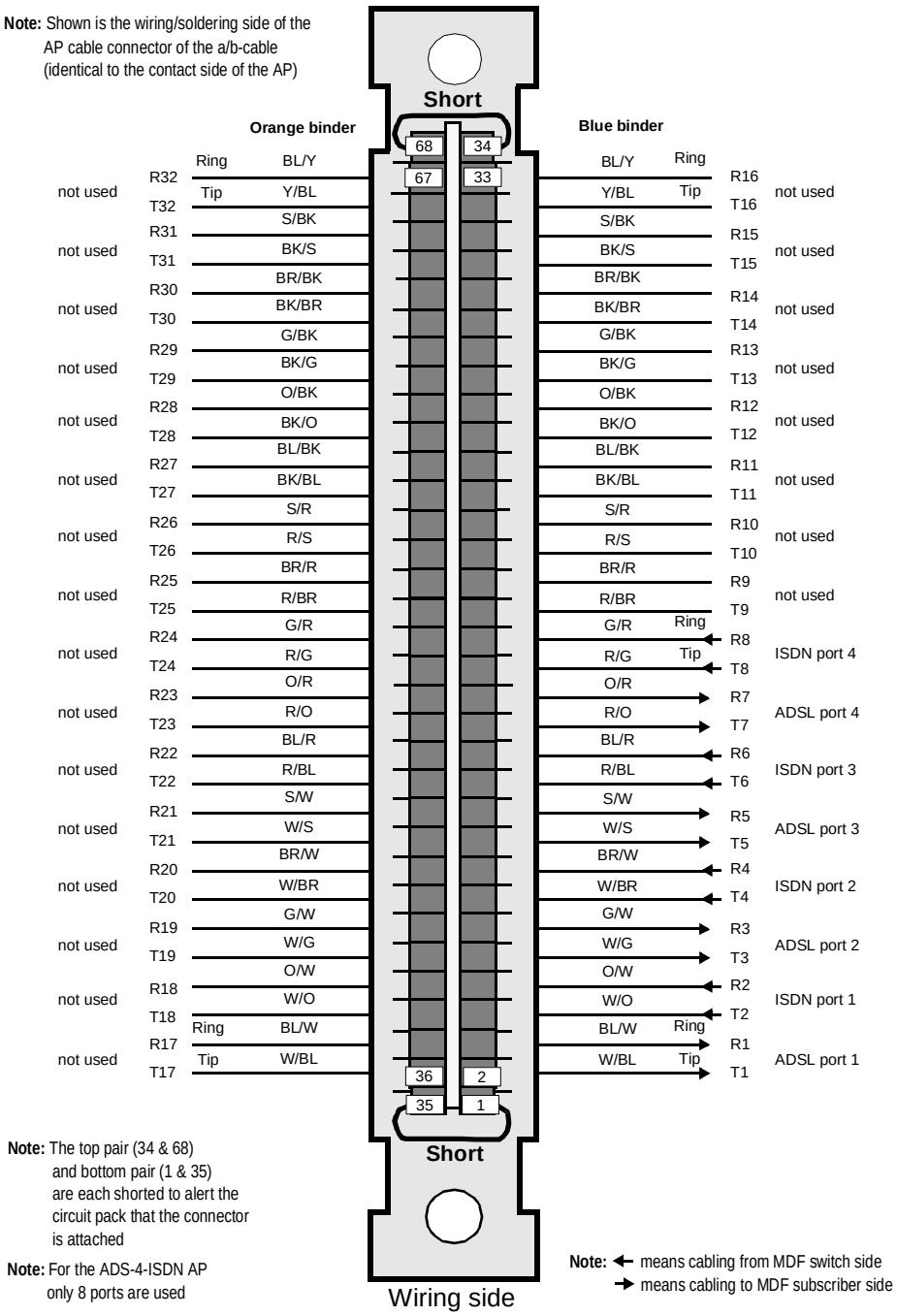

Note: Shown is the wiring/soldering side of the AP cable connector of the a/b-cable (identical to the contact side of the AP)
Short
Orange binder
Blue binder
68
34
67
33
36
2
35
1
Short
Wiring side
Note: The top pair (34 & 68) and bottom pair (1 & 35) are each shorted to alert the circuit pack that the connector is attached
Note: For the ADS-4-ISDN AP only 8 ports are used
Note: ← means cabling from MDF switch side
→ means cabling to MDF subscriber side
not used R32 Ring BL/Y
not used T32 Tip Y/BL
not used R31 S/BK
not used T31 BK/S
not used R30 BR/BK
not used T30 BK/BR
not used R29 G/BK
not used T29 BK/G
not used R28 O/BK
not used T28 BK/O
not used R27 BL/BK
not used T27 BK/BL
not used R26 S/R
not used T26 R/S
not used R25 BR/R
not used T25 R/BR
not used R24 G/R
not used T24 R/G
not used R23 O/R
not used T23 R/O
not used R22 BL/R
not used T22 R/BL
not used R21 S/W
not used T21 W/S
not used R20 BR/W
not used T20 W/BR
not used R19 G/W
not used T19 W/G
not used R18 O/W
not used T18 W/O
not used R17 Ring BL/W
not used T17 Tip W/BL
BL/Y Ring R16 not used
Y/BL Tip T16 not used
S/BK R15 not used
BK/S T15 not used
BR/BK R14 not used
BK/BR T14 not used
G/BK R13 not used
BK/G T13 not used
O/BK R12 not used
BK/O T12 not used
BL/BK R11 not used
BK/BL T11 not used
S/R R10 not used
R/S T10 not used
BR/R R9 not used
R/BR T9 not used
G/R Ring R8 ISDN port 4
R/G Tip T8 ISDN port 4
O/R R7 ADSL port 4
R/O T7 ADSL port 4
BL/R R6 ISDN port 3
R/BL T6 ISDN port 3
S/W R5 ADSL port 3
W/S T5 ADSL port 3
BR/W R4 ISDN port 2
W/BR T4 ISDN port 2
G/W R3 ADSL port 2
W/G T3 ADSL port 2
O/W R2 ISDN port 1
W/O T2 ISDN port 1
BL/W Ring R1 ADSL port 1
W/BL Tip T1 ADSL port 1

Figure 4-24 Pinning of ADSL connector (4 ADSL ports / 4 ISDN splitter)

The connector is used for ADSL cables of ADSL4i application pack (LPA414; 2B1Q/4B3T coding) in positions AP-1 to AP-8.

ADSL16i connector for 16 ADSL/16 ISDN splitter

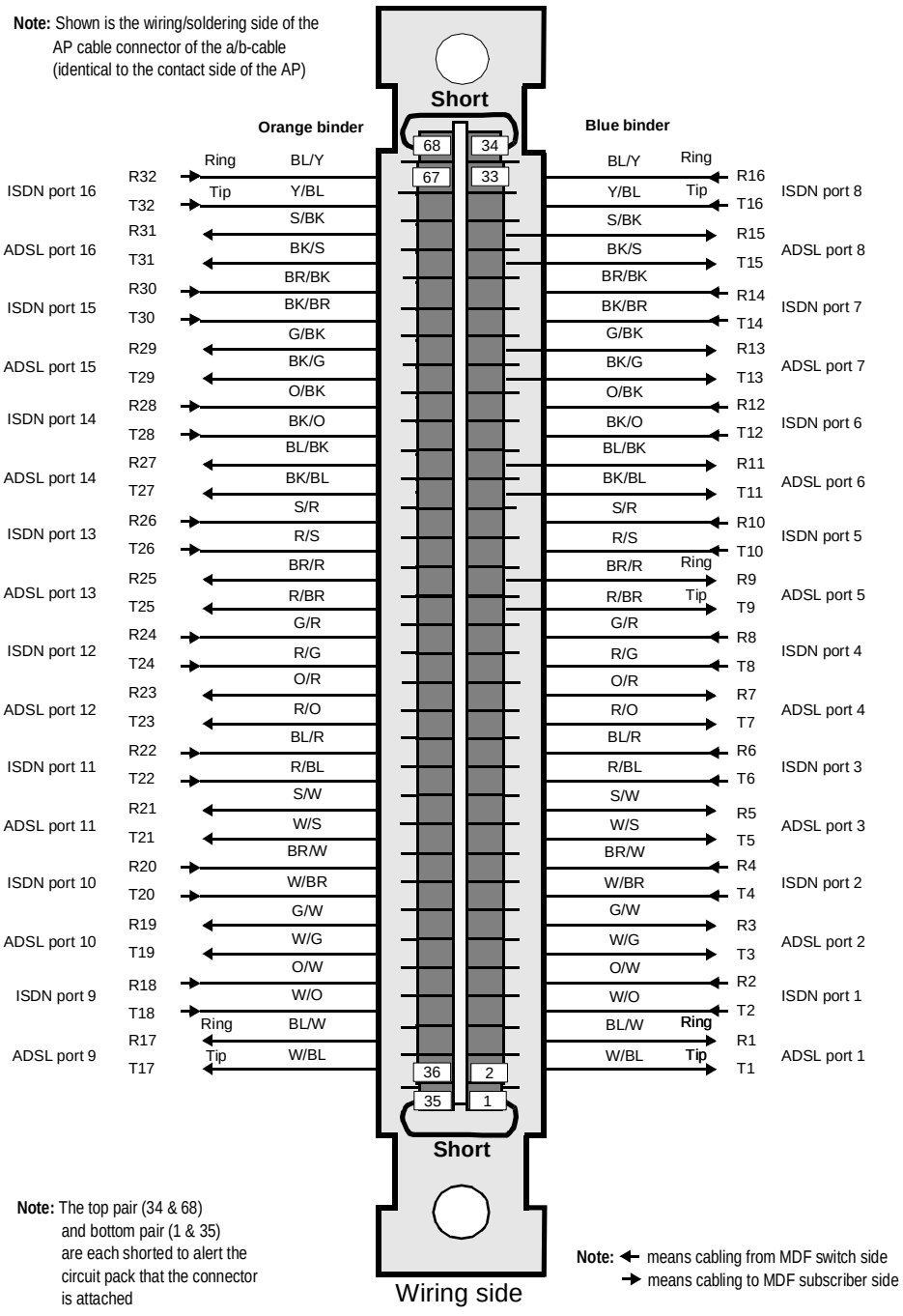


Figure 4-25 Pinning of ADSL connector (16 ADSL ports / 16 ISDN splitter)

The connector is used for ADSL cables of ADSL16i application pack (LPA417; 2B1Q/4B3T coding) in positions AP-1 to AP-8.

SDSL AP connector for 16 ports

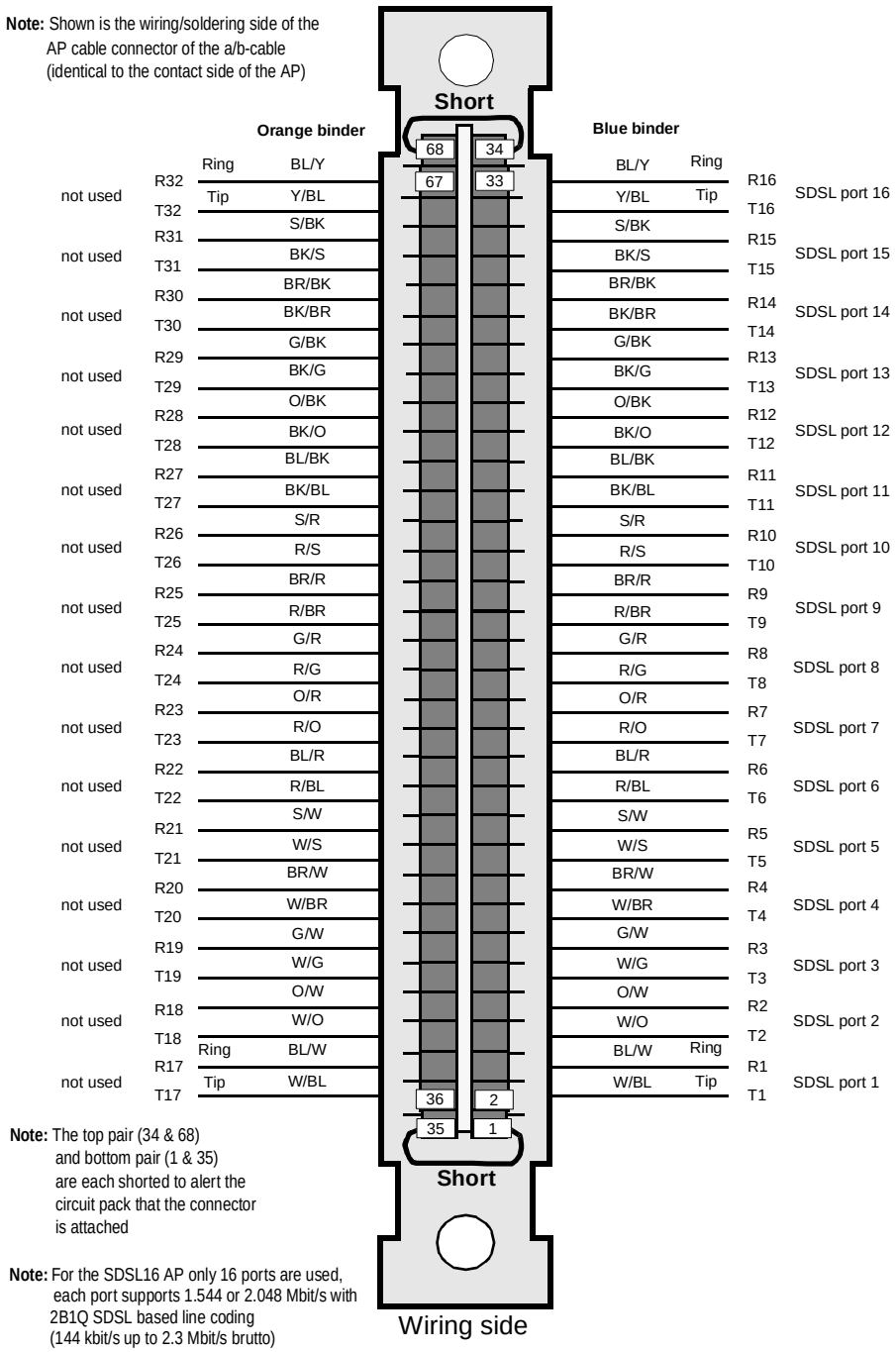


Figure 4-26 Pinning of SDSL connector (symmetrical DSL)

The connector is used for SDSL cables of SDSL16 application pack (LPS716) in positions AP-1 to AP-8.

4.5.2.8 HDSL/SHDSL AP connectors

HDSL AP connector for 4 ports

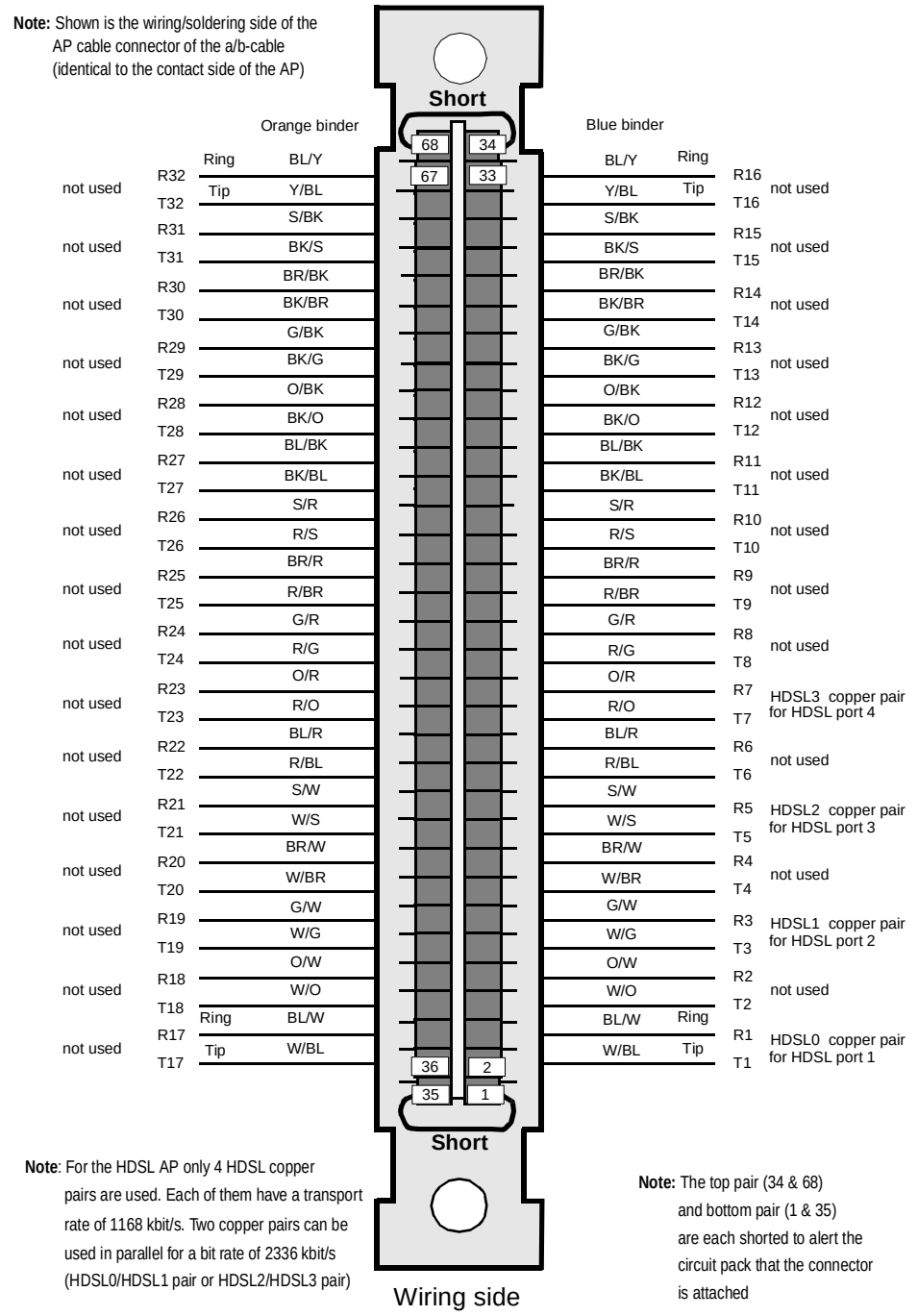

Note: Shown is the wiring/soldering side of the AP cable connector of the a/b-cable (identical to the contact side of the AP)
Short
Orange binder
Blue binder
68
34
67
33
36
2
35
1
Short
Wiring side
not used R32 Ring BL/Y
not used T32 Tip Y/BL
not used R31 S/BK
not used T31 BK/S
not used R30 BR/BK
not used T30 BK/BR
not used R29 G/BK
not used T29 BK/G
not used R28 O/BK
not used T28 BK/O
not used R27 BL/BK
not used T27 BK/BL
not used R26 S/R
not used T26 R/S
not used R25 BR/R
not used T25 R/BR
not used R24 G/R
not used T24 R/G
not used R23 O/R
not used T23 R/O
not used R22 BL/R
not used T22 R/BL
not used R21 S/W
not used T21 W/S
not used R20 BR/W
not used T20 W/BR
not used R19 G/W
not used T19 W/G
not used R18 O/W
not used T18 W/O
not used R17 Ring BL/W
not used T17 Tip W/BL
BL/Y Ring R16
Y/BL Tip T16 not used
S/BK R15
BK/S T15 not used
BR/BK R14
BK/BR T14 not used
G/BK R13
BK/G T13 not used
O/BK R12
BK/O T12 not used
BL/BK R11
BK/BL T11 not used
S/R R10
R/S T10 not used
BR/R R9
R/BR T9 not used
G/R R8
R/G T8 not used
O/R R7
R/O T7 HDSL3 copper pair for HDSL port 4
BL/R R6
R/BL T6 not used
S/W R5
W/S T5 HDSL2 copper pair for HDSL port 3
BR/W R4
W/BR T4 not used
G/W R3
W/G T3 HDSL1 copper pair for HDSL port 2
O/W R2
W/O T2 not used
BL/W Ring R1
W/BL Tip T1 HDSL0 copper pair for HDSL port 1
Note: For the HDSL AP only 4 HDSL copper pairs are used. Each of them have a transport rate of 1168 kbit/s. Two copper pairs can be used in parallel for a bit rate of 2336 kbit/s (HDSL0/HDSL1 pair or HDSL2/HDSL3 pair)
Note: The top pair (34 & 68) and bottom pair (1 & 35) are each shorted to alert the circuit pack that the connector is attached

Figure 4-27 Pinning of HDSL connector (4 ports)

The connector is used for HDSL cables of HDSL application pack (LPS501) with V5 interface providing 4 HDSL ports in positions AP-1 to AP-8.

HDSL AP connector for 4 ports (V3 interface)

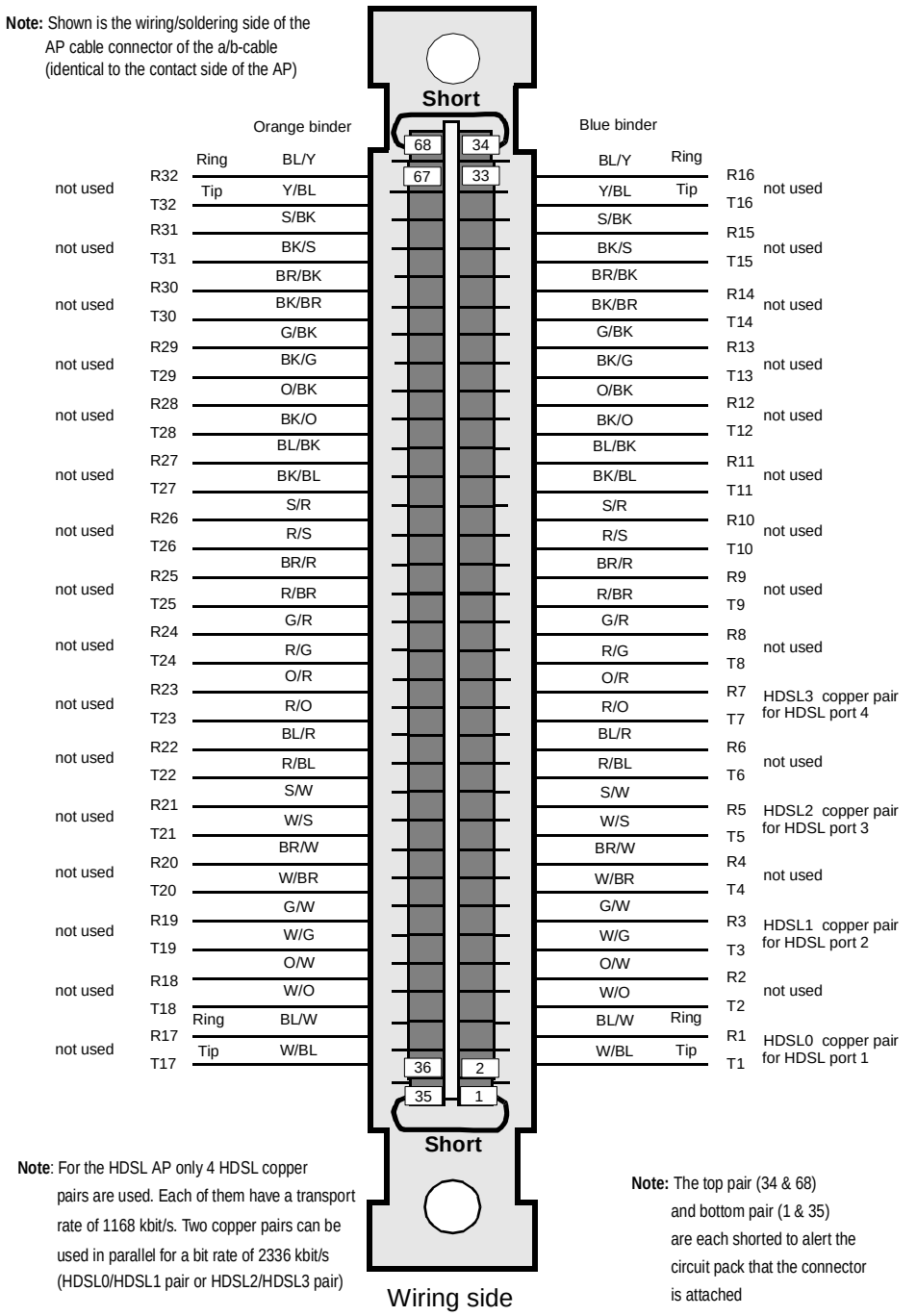


Figure 4-28 Pinning of HDSL connector (4 ports)

The connector is used for HDSL cables of HDSL application pack (LPS503/LPS504) with V5/V3 interface for 4 ports in positions AP-1 to AP-8.

SHDSL AP connector for 8 SHDSL ports

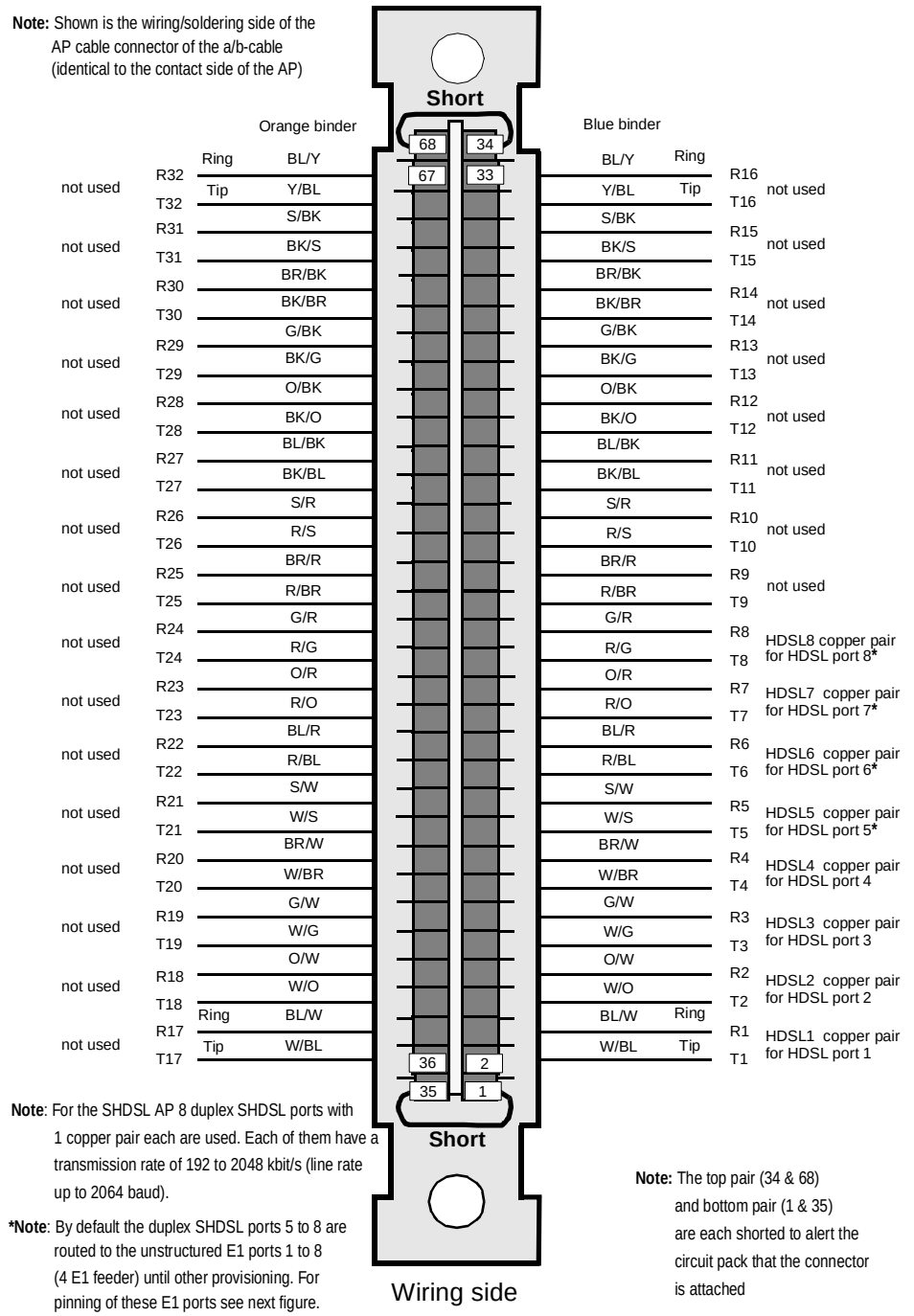

Note: Shown is the wiring/soldering side of the AP cable connector of the a/b-cable (identical to the contact side of the AP)
Short
Orange binder
Blue binder
68
34
67
33
36
2
35
1
Short
Wiring side
not used R32 Ring BL/Y
not used T32 Tip Y/BL
not used R31 S/BK
not used T31 BK/S
not used R30 BR/BK
not used T30 BK/BR
not used R29 G/BK
not used T29 BK/G
not used R28 O/BK
not used T28 BK/O
not used R27 BL/BK
not used T27 BK/BL
not used R26 S/R
not used T26 R/S
not used R25 BR/R
not used T25 R/BR
not used R24 G/R
not used T24 R/G
not used R23 O/R
not used T23 R/O
not used R22 BL/R
not used T22 R/BL
not used R21 S/W
not used T21 W/S
not used R20 BR/W
not used T20 W/BR
not used R19 G/W
not used T19 W/G
not used R18 O/W
not used T18 W/O
not used R17 Ring BL/W
not used T17 Tip W/BL
BL/Y Ring R16
Y/BL Tip T16 not used
S/BK R15
BK/S T15 not used
BR/BK R14
BK/BR T14 not used
G/BK R13
BK/G T13 not used
O/BK R12
BK/O T12 not used
BL/BK R11
BK/BL T11 not used
S/R R10
R/S T10 not used
BR/R R9
R/BR T9 not used
G/R R8
R/G T8 HDSL8 copper pair for HDSL port 8*
O/R R7
R/O T7 HDSL7 copper pair for HDSL port 7*
BL/R R6
R/BL T6 HDSL6 copper pair for HDSL port 6*
S/W R5
W/S T5 HDSL5 copper pair for HDSL port 5*
BR/W R4
W/BR T4 HDSL4 copper pair for HDSL port 4
G/W R3
W/G T3 HDSL3 copper pair for HDSL port 3
O/W R2
W/O T2 HDSL2 copper pair for HDSL port 2
BL/W Ring R1
W/BL Tip T1 HDSL1 copper pair for HDSL port 1
Note: For the SHDSL AP 8 duplex SHDSL ports with 1 copper pair each are used. Each of them have a transmission rate of 192 to 2048 kbit/s (line rate up to 2064 baud).
*Note: By default the duplex SHDSL ports 5 to 8 are routed to the unstructured E1 ports 1 to 8 (4 E1 feeder) until other provisioning. For pinning of these E1 ports see next figure.
Note: The top pair (34 & 68) and bottom pair (1 & 35) are each shorted to alert the circuit pack that the connector is attached

Figure 4-29 Pinning of SHDSL connector (8 ports)

The connector is used for SHDSL cable of SHDSL application pack (LPS510) with 8 duplex-mode SHDSL ports in positions AP-1 to AP-16.

The SHDSL AP has a second 20-pin AMP connector E1 for 4 unstructured E1 ports which are **not** used for ONU applications (4 E1 upstream/downstream each), the E1 connector position, see Figure 4-17, page 4-25; for pinning, see Figure 4-30, page 4-38.

E1 connector for 8 E1 ports on the SHDSL AP

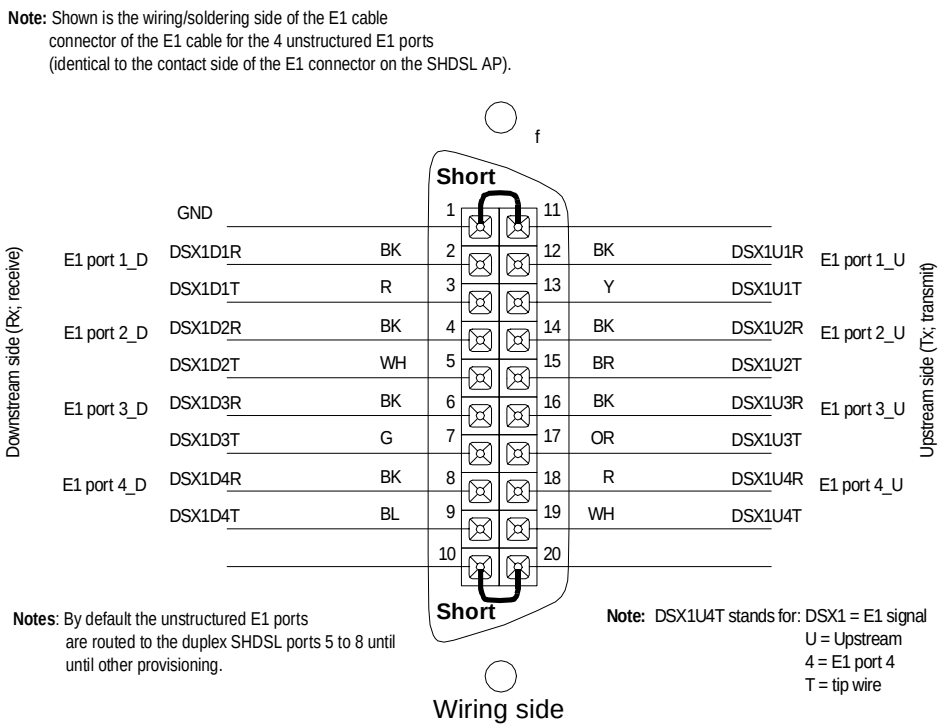


Figure 4-30 Pinning of the E1 cable connector E1 (4 unstructured E1 ports)

The 20-pin AMP connector (AMPLIMATE .050 series) is used for the E1 cable of the SHDSL AP (LPS510). The SHDSL AP has a also the standard 68-pin AP connector for the 8 duplex SHDSL ports, see Figure 4-29 on the previous page 4-37. The 8x2 twisted pair cable must have an impedance of 120 Ω.

NOTE:
Four pins on this 20-pin connector have to be shorted so that the *AnyMedia* Access System can verify whether an E1 cable is connected or not.

For future use the ED7C860-30 Gr1x cable will be provided with the male 20-pin AMP connector on the SHDSL side and an open end on the other side. For the cable a 9 x 2paired cable with 28 AWG is used where the 9.th pair is not used. On the connector pin 1and 10 and also pin 11 and 20 are crossed.

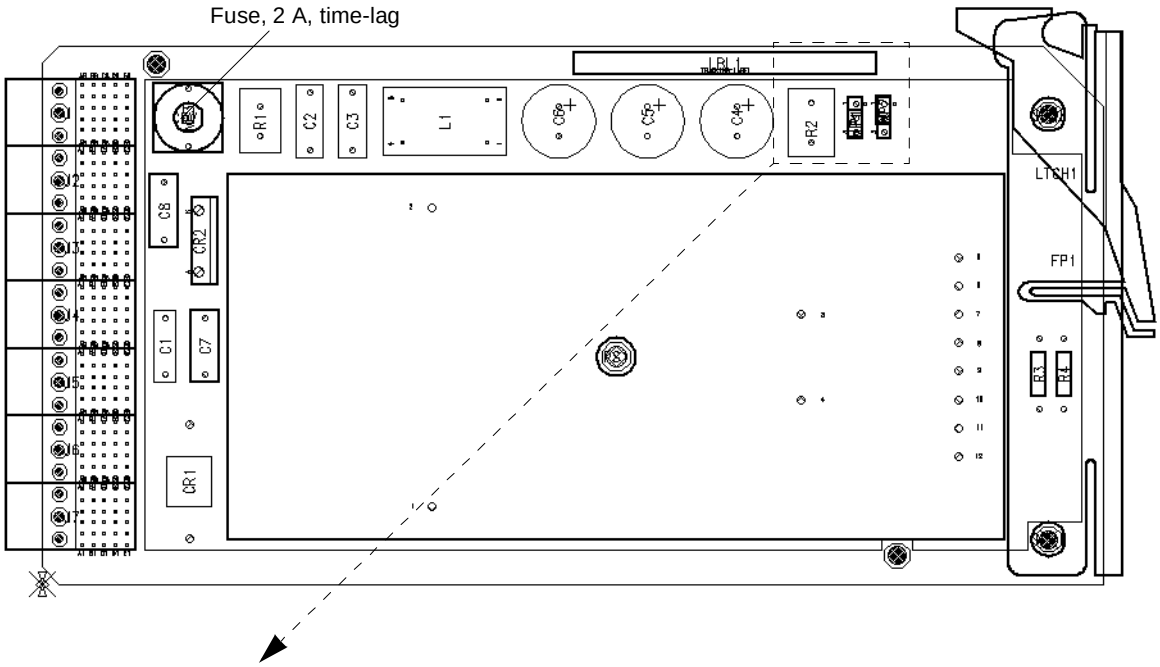
4.5.3 Ringing generator unit (RGU) RGU500

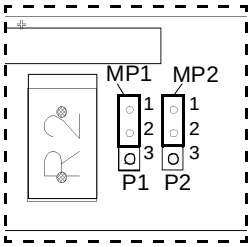
The RGU does not have faceplate connectors.

The RGU is equipped with two jumpers for adjusting the ringing frequency.

4.5.3.1 Adjusting the ringing frequency

There are two jumpers, MP1 with header P1 and MP2 with header P2, on the pack for setting the four output frequencies. These frequencies are: 17 Hz, 20 Hz, 25 Hz and 50 Hz. The default frequency setting is 25 Hz.





Jumper MP1 setting for header P1 and jumper MP2 setting for header P2 to adjust the ringing frequency:

Ringing frequency	Jumper MP1	Jumper MP2	Remarks
17 Hz	2-3	2-3	
20 Hz	2-3	1-2	
25 Hz	1-2	1-2	Default frequency factory setting
50 Hz	1-2	2-3	

Figure 4-31 Location and configuration of the jumpers on the RGU for ringing frequencies

4.6 Example of subscriber numbering and MDF assignment

Subscriber numbering and connections to the MDF

The subscriber lines of the application packs (for POTS AP) are numbered from 1 to 256 per ONU Subshelf. The table below shows the subscriber numbering and the allocation to the Z port numbers, which are numbered from 1 to 32 per application pack. An example of the assignment of an MDF is indicated in the next chapter.

For the metallic test path (TAP-B cable) terminals 225a to 226b and 258a to 259b are used in the example for the MDF assignment, see Table 4-8, page 4-44.

The internal cable connections for an MDF with 10 a/b-terminals per connector block are shown as an example in the following tables.

NOTE:
The connector pins of the application pack cable connector count from 1 to 68, the potential numbers of the application pack count from 0 to 33 and 100 to 133 for the 68 pins.

Table 4-7 Channel numbering and connections to MDF (example), external cable ED 7C818-30 Gr.1x from ONU Subshelf, APs to the MDF

Sub-scriber no.	AP no.	Circuit no. of the AP	Potential no. of the AP conn.	Pin of AP cable connector	Wire		MDF (10 pins/row)
--	AP 01	-	0	1 (shorted to pin 35)	-		no connection
1		1	1	2 (T1, Tip, a-wire)	W-BL	blue binder	001a
			2	3 (R1, Ring, b-wire)	BL-W		001b
2		2	3	4 (T2)	W-O		002a
			4	5 (R2)	O-W		002b
3		3	5	6 (T3)	W-G		003a
			6	7 (R3)	G-W		003b
4		4	7	8 (T4)	W-BR		004a
			8	9 (R4)	BR-W		004b
5		5	9	10 (T5)	W-S		005a
			10	11 (R5)	S-W		005b
6		6	11	12 (T6)	R-BL		006a
			12	13 (R6)	BL-R		006b
7		7	13	14 (T7)	R-O		007a
			14	15 (R7)	O-R		007b
8		8	15	16 (T8)	R-G		008a
			16	17 (R8)	G-R		008b
9		9	17	18 (T9)	R-BR		009a
			18	19 (R9)	BR-R		009b
10		10	19	20 (T10)	R-S		010a
			20	21 (R10)	S-R		010b
11		11	21	22 (T11)	BK-BL		011a
			22	23 (R11)	BL-BK		011b
12		12	23	24 (T12)	BK-O		012a
			24	25 (R12)	O-BK		012b
13		13	25	26 (T13)	BK-G		013a
			26	27 (R13)	G-BK		013b
14		14	27	28 (T14)	BK-BR		014a
			28	29 (R14)	BR-BK		014b
15		15	29	30 (T15)	BK-S		015a
			30	31 (R15)	S-BK		015b
16		16	31	32 (T16)	Y-BL		016a
			32	33 (R16)	BL-Y		016b
-		-	33	34 (shorted to pin 68)	-		no connection

Table 4-7 Channel numbering and connections to MDF (example), external cable ED 7C818-30 Gr.1x from ONU Subshelf, APs to the MDF –*Continued*

Sub-scriber no.	AP no.	Circuit no. of the AP	Potential no. of the AP conn.	Pin of AP cable connector	Wire		MDF (10 pins/row)
-	AP 01	-	100	35 (shorted to pin 1)	-		no connection
17		17	101	36 (T17)	W-BL	orange binder	017a
			102	37 (R17)	BL-W		017b
18		18	103	38 (T18)	W-O		018a
			104	39 (R18)	O-W		018b
19		19	105	40 (T19)	W-G		019a
			106	41 (R19)	G-W		019b
20		20	107	42 (T20)	W-BR		020a
			108	43 (R20)	BR-W		020b
21		21	109	44 (T21)	W-S		021a
			110	45 (R21)	S-W		021b
22		22	111	46 (T22)	R-BL		022a
			112	47 (R22)	BL-R		022b
23		23	113	48 (T23)	R-O		023a
			114	49 (R23)	O-R		023b
24		24	115	50 (T24)	R-G		024a
			116	51 (R24)	G-R		024b
25		25	117	52 (T25)	R-BR		025a
			118	53 (R25)	BR-R		025b
26		26	119	54 (T26)	R-S		026a
			120	55 (R26)	S-R		026b
27		27	121	56 (T27)	BK-BL		027a
			122	57 (R27)	BL-BK		027b
28		28	123	58 (T28)	BK-O		028a
			124	59 (R28)	O-BK		028b
29		29	125	60 (T29)	BK-G		029a
			126	61 (R29)	G-BK		029b
30		30	127	62 (T30)	BK-BR		030a
			128	63 (R30)	BR-BK		030b
31		31	129	64 (T31)	BK-S		031a
			130	65 (R31)	S-BK		0031b
32		32	131	66 (T32)	Y-BL		032a
			132	67 (R32)	BL-Y		032b
-		-	133	68 (shorted to 34)			no connection

Table 4-7 Channel numbering and connections to MDF (example), external cable ED 7C818-30 Gr.1x from ONU Subshelf, APs to the MDF –*Continued*

Sub-scriber no.	AP no.	Circuit no. of the AP	Potential no. of the AP conn.	Pin of AP cable connector	Wire		MDF (10 pins/row)
-	AP 02	-	1	1 (shorted to 35)			no connection
33		1	2	2 (T1, Tip)	W-BL	blue binder	033a
			3	3 (R1, Ring)	BL-W		033b
34		2	4	4 (T2)	W-O		034a
			5	5 (R2)	O-W		034b
...		...		...			...
				...			...
48		16	31	32 (T16)	Y-BL		048a
			32	33 (R16)	BL-Y		048b
-		-	33	34 (shorted to pin 68)	-		no connection
-		-	100	35 (shorted to pin 1)	-		no connection
49		17	101	36 (T17)	W-BL	orange binder	49a
			102	37 (R17)	BL-W		049b
...		...		....			
				....			
64		32	131	66 (T32)	Y-BL		064a
			132	67 (R32)	BL-Y		064b
-		-	133	68 (shorted to 34)			no connection
65 to 96	AP 03	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			065a to 096b
97 to 128	AP 04	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			097a to 128b
129 160	AP 05	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			129a to 160b
161 to 192	AP 06	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			161a to 192b
193 to 224	AP 07	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			193a to 224b
225 to 256	AP 08	1 to 32	2 to 33 / 100 to 133	2 (T1) to 67 (R32)			225a to 256b
-	**or TAP100 in-serted in AP8**	-	1	1 (shorted to 35)			no connection
225		1	1 (TAP_EQ_T)[a]	2 (T1, Tip, a-wire)	W-BL	blue/orange binder	225a
			2 (TAP_EQ_R)[a]	3 (R1, Ring, b-wire)	BL-W		225b
226		2	3 (TAP_FAC_T)[a]	4 (T2)	W-O		226a
			4 (TAP_FAC_R)[a]	5 (R2)	O-W		226b
227 to 256		3 to 32	5 to 33 / 103 to 133	6 (T3) to 67 (R132)			227a to 256b

a Only if the TAP100 is inserted into the AP-8 slot.

For example the table below shows the MDF connections for the TAP-B cable.

Table 4-8 Connections to the MDF (example), external cable ED 7C818-36 Gr.1x from ONU Subshelf, TAP-B connector to the switch side of the MDF

TAP100 cable		TAP-B cable			
MDF connection for TAP100 only		***AnyMedia* signal of the TAP-B**	**Pin of TAP-B cable connector**	**Wire[a]**	**MDF (10 pins/row)**
		-	1 to 12 not used	-	
		not used	(31, not connected)	W-BL	257a
		TAPB_SEIZE	13	BL-W	257b
		TAPB-EQ-T1	32	W-O	258a
		TAPB-EQ-R1	14	O-W	258b
225a (W-BL)	Equipment (port 1)	TAPB-EQ-T = Tip 1 of TAP100	33	W-G	259a
225b (BL-W)		TAPB-EQ-R = Ring 1 of TAP100	15	G-W	259b
226a (W-O)	Facility[b] (port 2)	TAPB-FAC-T = Tip 2 of TAP100	34	W-BR	260a
226b (O-W)		TAPB-FAC-R = Ring 2 TAP100	16	BR-W	260b
		TAPB-FAC-T1	35	W-S	261a
		TAPB-FAC-R1	17	S-W	261b
		TAPB-FAC-E	36	R-BL	262a
		TAPB-FAC-M	18	BL-R	262b
		TAPB-EQ-E	37	R-O	263a
		TAPB-EQ-M	19	O-R	263b
		-	20 to 30 not used	-	

a Cable colors valid for the ED7C818-36 Gr1, ...1A, ...1B, ...1C cable.

b For testing currently not supported.

MDF assignment

The figure below shows an example of the MDF assignment for an MDF with 10 a/b-terminals per connector block, corresponding to the tables above.

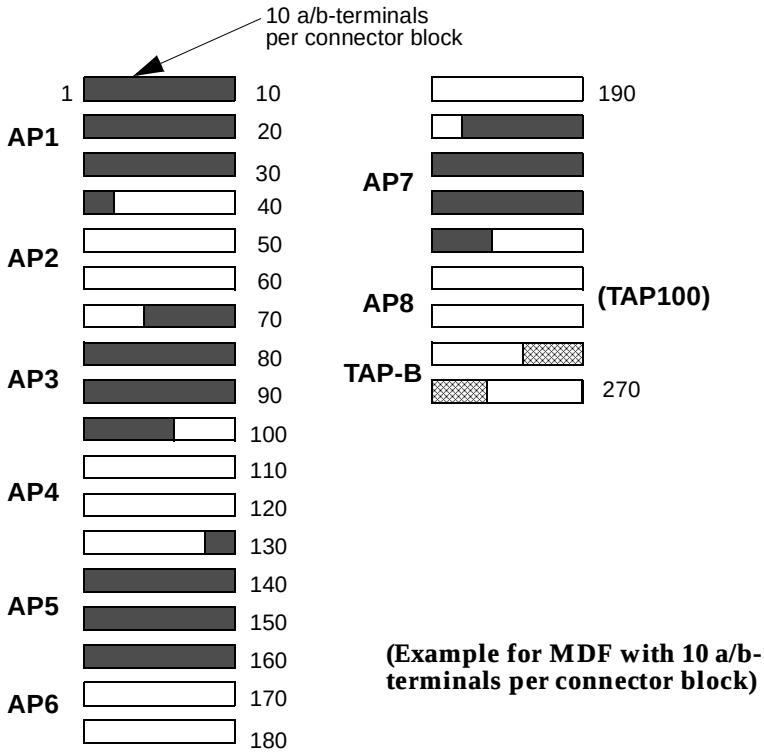


Figure 4-32 MDF wiring for the system side

4.7 Rectifier shelf

Into the rectifier shelf the power rectifier unit (PRU) and the low voltage disconnect unit (LVD) will be inserted.

4.7.1 Backplane of the rectifier shelf

On the backplane of the rectifier shelf in the area where the LVD is inserted different connectors are located which are used for the factory delivered cabling to the ONU Subshelf, to the batteries and to the fan unit. These cables are already connected at delivery.

The connectors are front accessible if the LVD is not inserted.

Connector J201 is the -48 V power connector and is connected to the ONU Subshelf, connector A1.

Connector J202 is the output alarm connector for the rectifier shelf. 7 environmental alarms for the rectifier, the batteries, the fan and for the LVD are used. For the alarms see Table 2-4, page 2-17. The J202 is connected to the ONU Subshelf, connector D1 for the alarm inputs.

J203 is the power and alarm connector for the 7A fan unit. This connector is connected to the J204 connector of the fan unit.

The blade terminal E1 is used for interconnecting -48RTN and FRMGND. The terminal E1 is connected to the M4 earthing point inside the ONU housing.

The blade terminals E2 and E3 are connected to the door switch for door alarming.

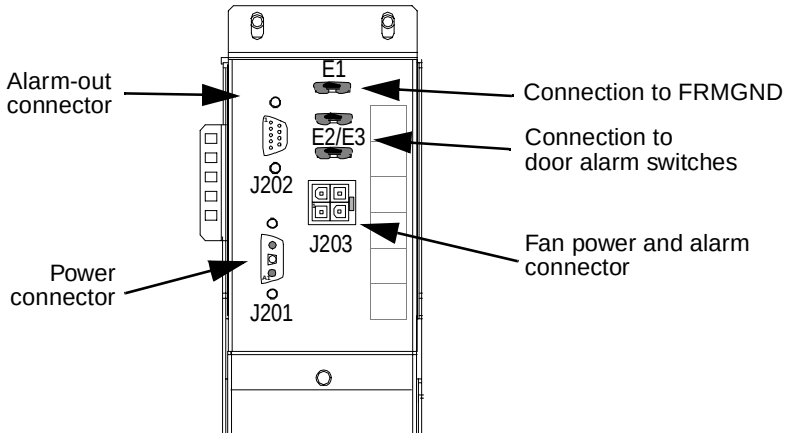


Figure 4-33 Backplane of the rectifier shelf in the LVD area

4.7.1.1 9-pin alarm-out connector J202

The pinning of the alarm connector is the same as described for the ALARM connector D1 of the ONU Subshelf, see figure below. For pinning of the ONU Subshelf connector D1 (ALARM) see Figure 4-9, page 4-13.

Connector J202

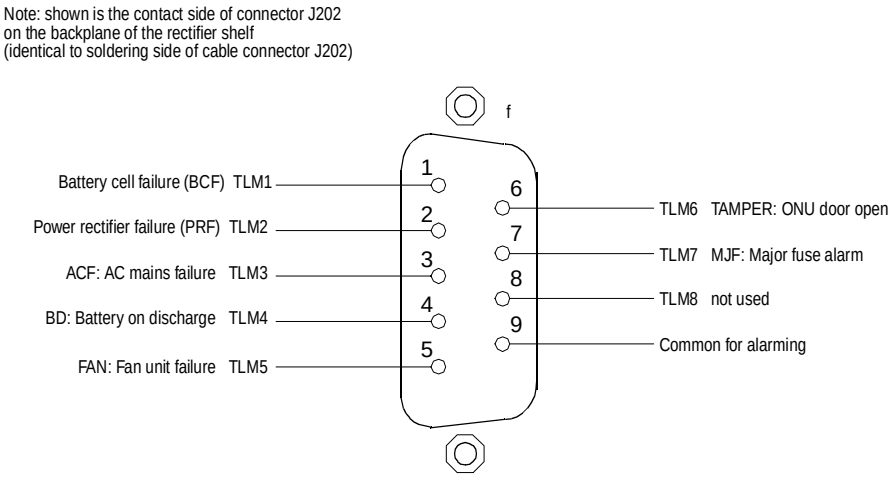


Figure 4-34 Pinning of alarm-out connector J202

4.7.1.2 3-pin -48V power connector J201

The pinning of the power connector is the same as described for the -48V connector A1 of the ONU Subshelf, see figure below. For pinning of the ONU Subshelf connector A1 (-48V) see Figure 4-6, page 4-11.

Connector J201

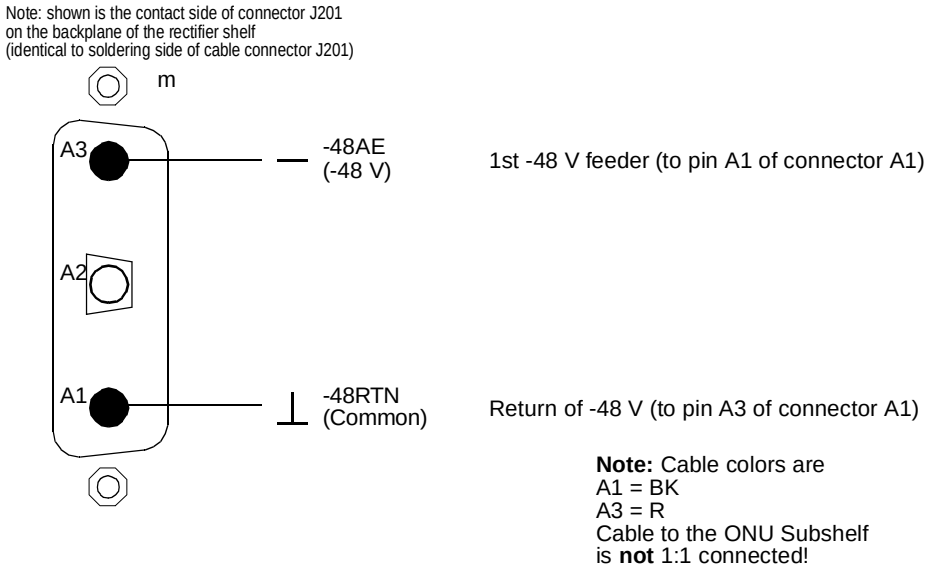

Note: shown is the contact side of connector J201
on the backplane of the rectifier shelf
(identical to soldering side of cable connector J201)
m
A3
A2
A1
-48AE
(-48 V)
-48RTN
(Common)
1st -48 V feeder (to pin A1 of connector A1)
Return of -48 V (to pin A3 of connector A1)
Note: Cable colors are
A1 = BK
A3 = R
Cable to the ONU Subshelf
is not 1:1 connected!

Figure 4-35 Pinning of the power connector J201

4.7.1.3 4-pin fan connector J203

Connector J203

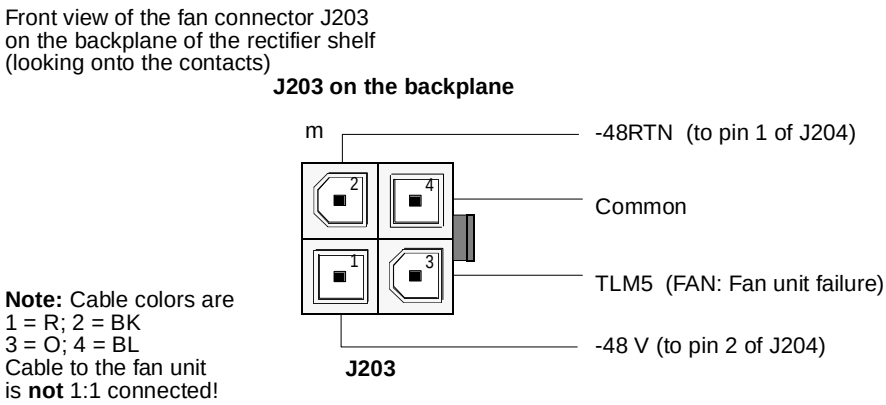


Figure 4-36 Pinning of the fan connector J203

4.7.2 Power rectifier unit (PRU) RS0450

Rectifier

The power rectifier unit is fed by AC mains (93 V up to 264 V; 47 Hz up to 63 Hz) via an IEC 60320 AC power inlet receptacle. The rectifier is buffered via 4 IR-30EC batteries which are connected to the PRU via the internal low voltage disconnect unit (LVD). This rectifier must be connected with the AC power cord 848506820.

The voltage of the rectifier can be adjusted via a 3-position Margin switch to -54.5 V ±0.4V, for compensation see Figure 2-5, page 2-13, for the characteristic of the rectifier see Figure 2-4, page 2-11.

The following figure shows the location of the connector for the battery thermal probe and the position of the Margin switch.

4.7.2.1 Rectifier Margin switch

The output voltage can be adapted via the Margin switch for 3 different voltages.

Table 4-9 Charging adjustments for the PRU via Margin switch

Margin switch position	Charging voltage [V][a]	Recommended battery type
MARG position "+"	-54.9 ±0.2 V	-
MARG position "0"[b]	-54.5 ±0.2 V	-
MARG position "-"	-54.1 ±0.2 V	IR-30EC

a The voltage is valid for 25°C and the thermal probe is connected to the PRU. If the thermal probe is not connected the voltage is fixed in the rectifier to -52.5 V.

b Factory setting as it is delivered.

4.7.2.2 Faceplate of the PRU

PRU faceplate

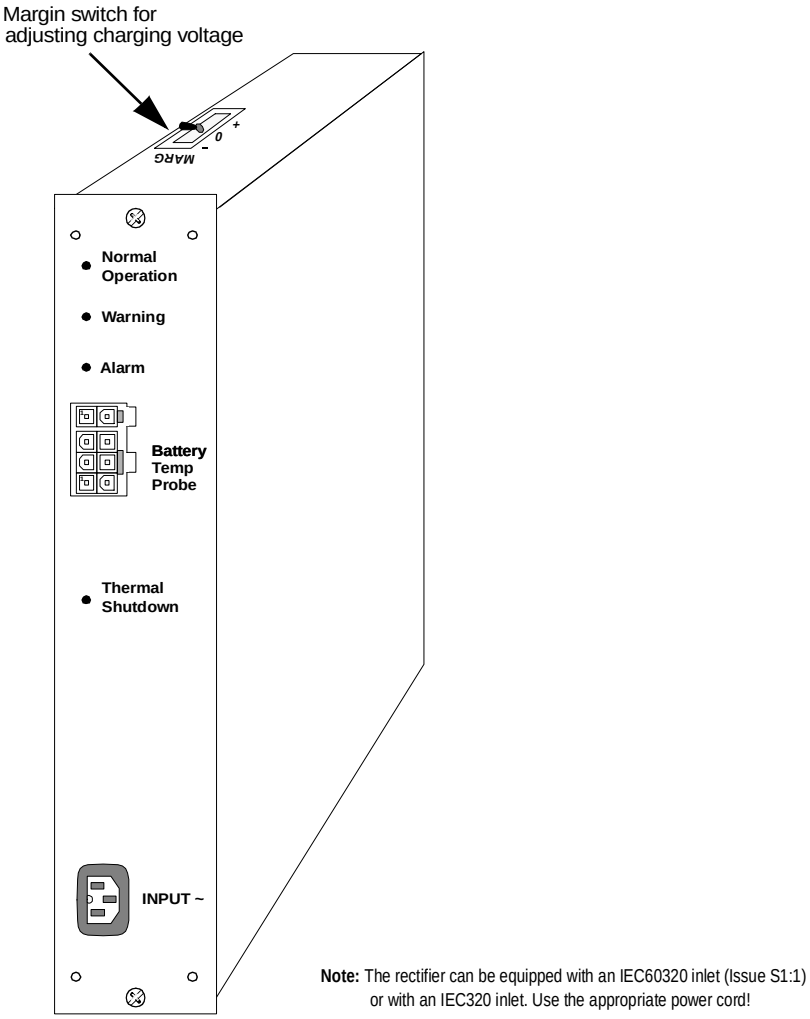


Figure 4-37 Faceplate and Margin switch of the power rectifier unit

4.7.2.3 Thermal probe connector

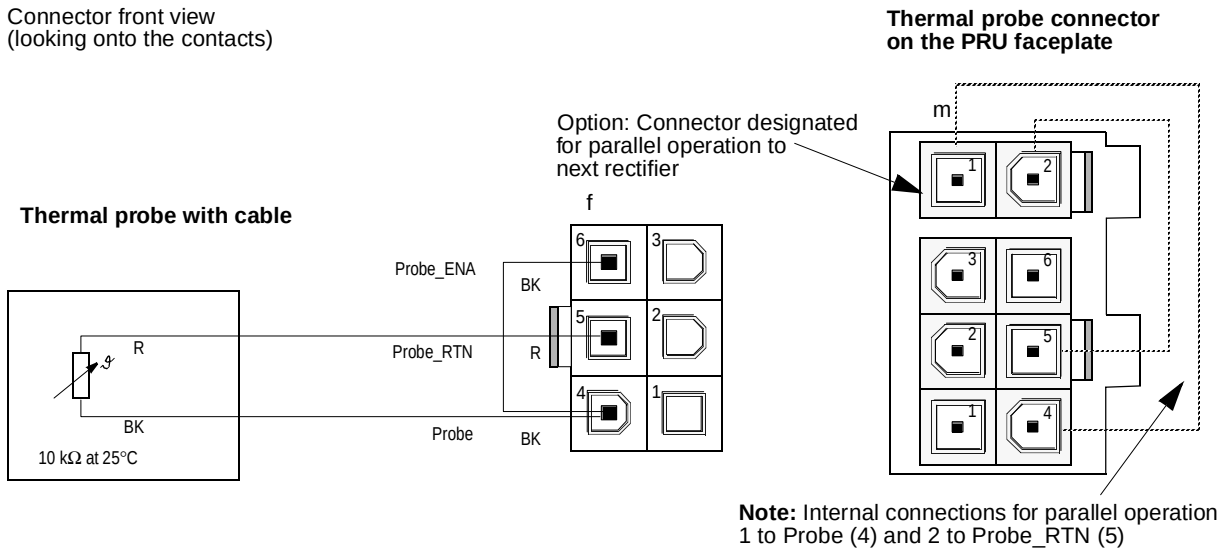


Figure 4-38 Connector and cabling of the thermal probe

4.7.2.4 AC mains connectors

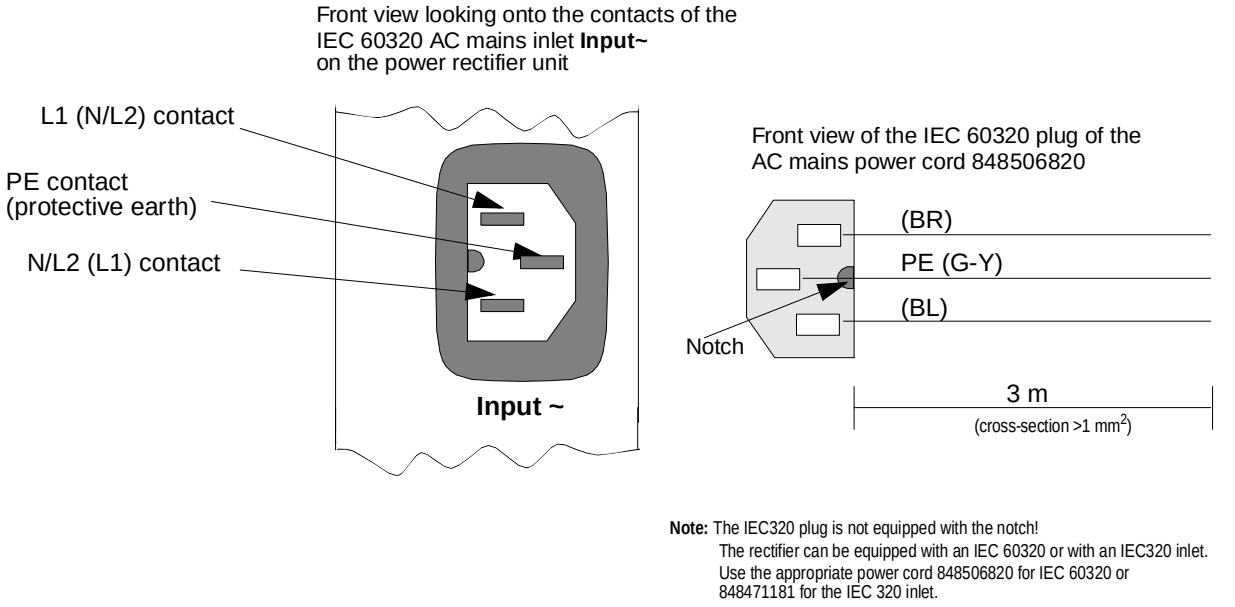

Front view looking onto the contacts of the
IEC 60320 AC mains inlet Input~
on the power rectifier unit
L1 (N/L2) contact
PE contact
(protective earth)
N/L2 (L1) contact
Input ~
Front view of the IEC 60320 plug of the
AC mains power cord 848506820
(BR)
PE (G-Y)
(BL)
Notch
3 m
(cross-section >1 mm2)
Note: The IEC320 plug is not equipped with the notch!
The rectifier can be equipped with an IEC 60320 or with an IEC320 inlet.
Use the appropriate power cord 848506820 for IEC 60320 or
848471181 for the IEC 320 inlet.

Figure 4-39 IEC 60320 mains connector on the PRU and connector of the power cord

4.7.3 Low voltage disconnect unit (LVD) LVD500

Low voltage disconnect

The LVD is designed for connecting the 4 IR-30EC batteries to the PRU. The LVD is equipped with an automatic battery disconnect feature which disconnects the batteries automatically if the battery voltage is <-42.5 V.

4.7.3.1 Faceplate of the LVD

The figure below shows the position of the controls and indicators of the LVD.

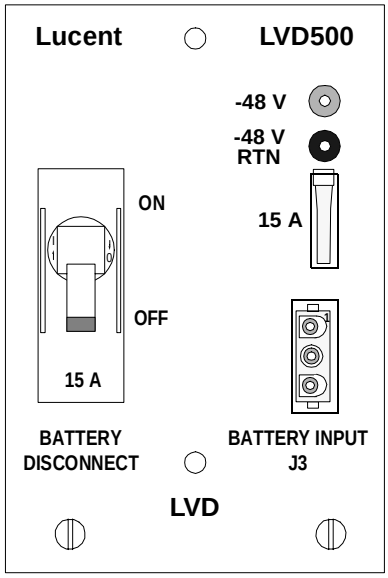


Figure 4-40 Faceplate of the LVD

4.7.3.2 Test jacks of the LVD

Test jacks (-48 V / -48 V RTN)

The LVD is equipped with test jacks for the -48 V voltage. These jacks are located in the path between the batteries and the battery fuse/battery circuit breaker.

The output voltage of the PRU measured on these jacks will be decreased by the voltage drop caused by the internal protection resistors and the internal resistance of the rectifier equipment. The voltage drop depends on the input resistance of the multimeter used.

4.7.3.3 Pinning of the battery connector J3

The following figure shows the pinning of the battery connector J3.

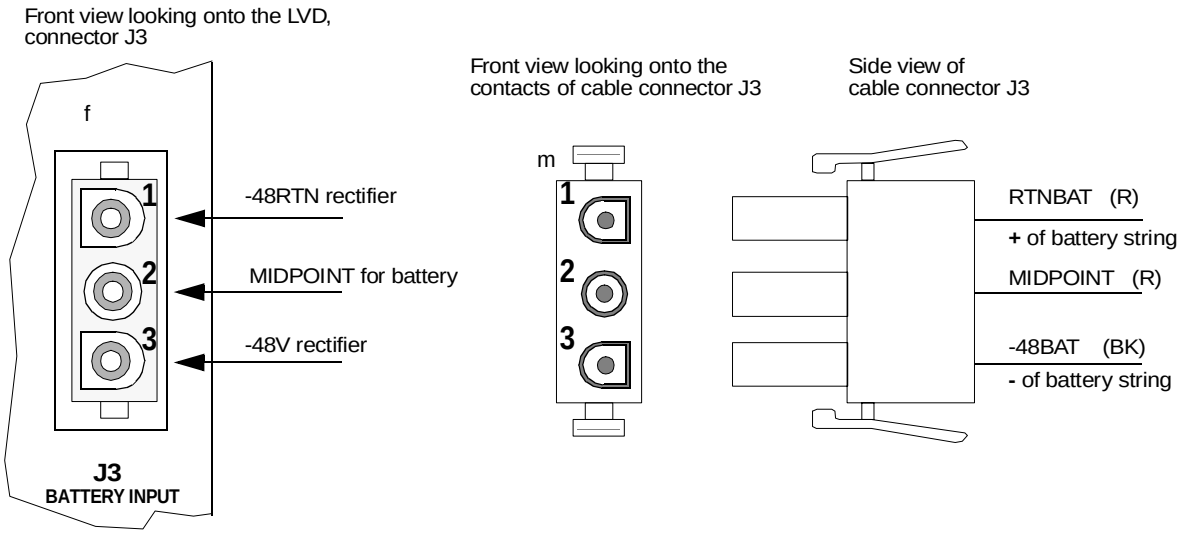


Figure 4-41 Pinning of connector J3 for the LVD and pinning of battery cable connector J3

4.8 Fan unit 7A

The ONU is factory equipped with the 7A fan unit to ensure correct heat dissipation. The fan unit is powered by the PRU.

The 4-wire cable is also used for alarming. The cable is connected to the connector J203 on the backplane of the rectifier shelf.

The following figure shows the location of the J204 connector.

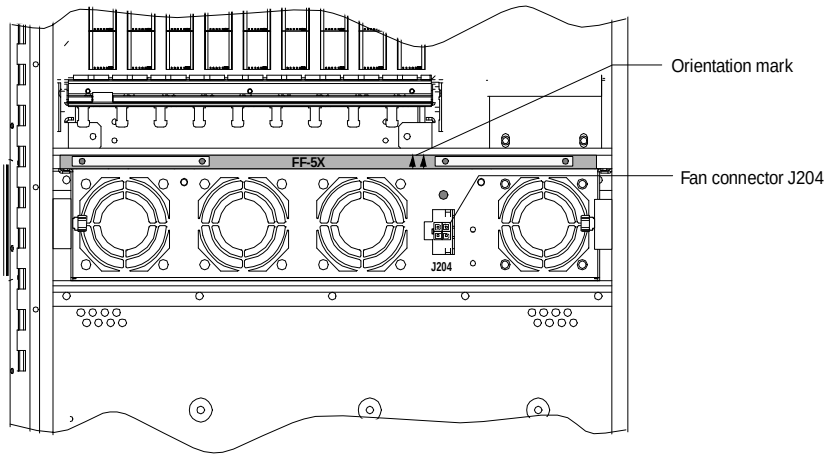


Figure 4-42 Position of the fan connector J204

The figure below shows the pinning of J204 inside the fan unit.

Connector J204

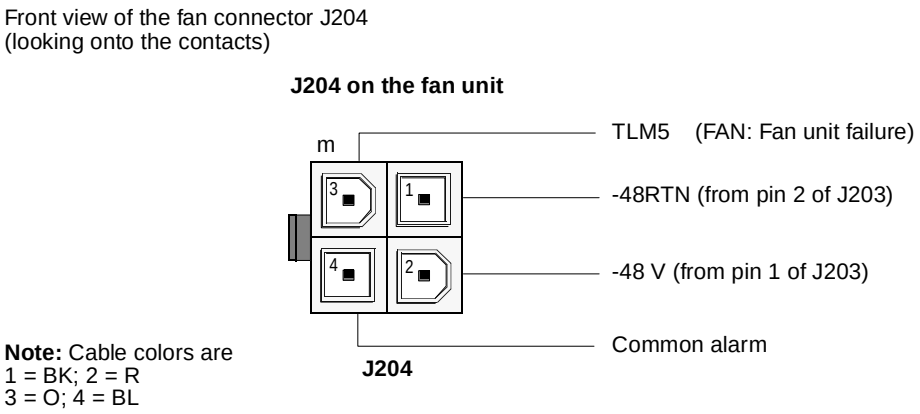


Figure 4-43 Pinning of the fan connector J204 of the fan unit

4.9 IR-30EC batteries

The ONU is buffered by 4 valve-regulated, lead-acid type (VRLA-type) batteries.

For easy interconnecting the batteries are factory equipped with 14 AWG lead assembly terminating with a pre-connected keyed 2-pin plug.

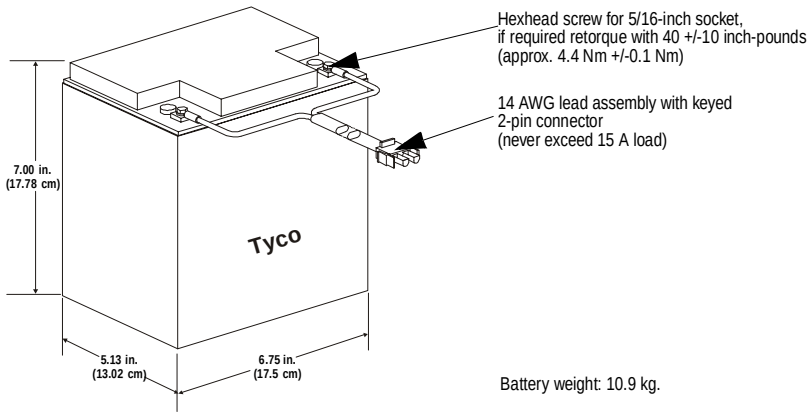


Figure 4-44 IR-30EC battery

The following figure shows the pinning of the battery connector for the 14 AWG lead assembly.

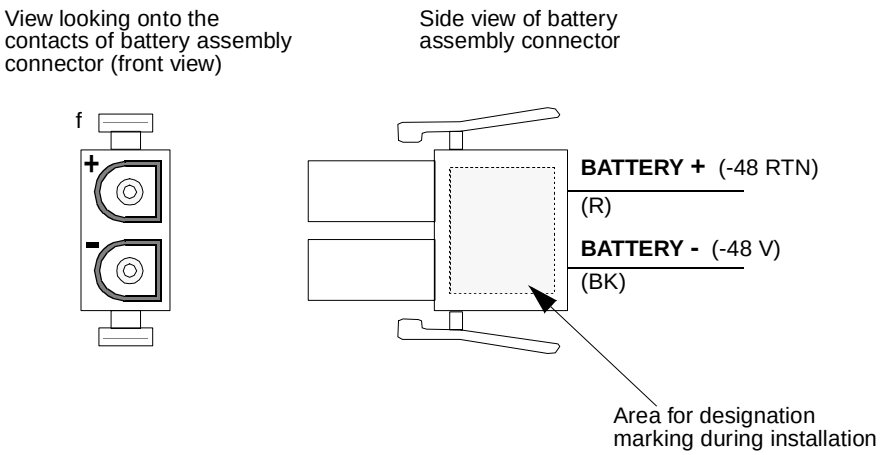


Figure 4-45 Pinning of the 14 AWG lead battery assembly connectors

Mounting and installation procedures

5

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Mounting and installation procedures

5

5.1 Overview of uncrating, mounting and grounding

This section gives the steps for mounting, installing and grounding the ONU.

The following instructions are contained in this section:

- Handling and uncrating the ONU, see Chapter 5.3.1, page 5-3 and Chapter 5.3.2, page 5-4
- Inspecting and physically verifying the condition of the ONU and the built-in shelves, see Chapter 5.3.3, page 5-5
- Checking the delivered internal cabling, see Chapter 5.3.4, page 5-8
- Marking the wall footprint for the wall layout, see Chapter 5.4.2, page 5-10
- Mounting the ONU onto plywood, see Chapter 5.4.3, page 5-13
- Making and checking the grounding connections, see Chapter 5.5, page 5-17.

5.2 General installation information

The default configuration of the *AnyMedia*® Optical Network Unit (ONU) for wall-mounted indoor applications with the Orderable Item No. ED7C841-01 is equipped with the ONU Subshelf, the rectifier shelf and with the fan assembly.

All the internal cabling is already included in the default configuration. The internal cables are routed and fixed near the positions where they have to be connected later or if possible they are connected already.

The ONU is prepared for easy installation of the packs and batteries.

All electrical connections should be made using the proper crimping tools and dies and torqued to values specified on the product labels or in the product documentation.

Table 5-1 Maximum torque for electrical connections

Screw size	Torque - lb-in or (lb-ft) or {Nm}[a]					
	Wire connections		Head tightened		Nut tightened	
	Slotted machine	Hex or socket cap	Slotted machine	Hex or socket cap	Slotted machine	Hex or socket cap
6-32	9	9	9	9	9	9
8-32	15	15	19	19	19	23
10-32	21	21	27	27	27	33
1/4-20	50	50	65	65	65	80
5/16-18	-	100	-	135	135	165
3/8-16	-	180	-	240	240	290
7/16-14	-	280	-	385	385	465
1/2-13	-	500	-	585	585	710
5/8-11	-	(71)	-	(97)	(97)	(118)
3/4-10	-	(125)	-	(172)	(172)	(209)
M3	{1}	{1}	{1}	{1}	{1}	{1}
M4	{1.6}	{1.6}	{1.6}	{1.6}	{1.6}	{1.6}
M5	{2.5}	{2.5}	{2.5}	{2.5}	{2.5}	{2.5}
M6	{6}	{6}	{6}	{6}	{6}	{6}
M8	{9}	{9}	{9}	{9}	{9}	{9}

a Not valid for batteries.

Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections. Always consider the maximum torque specified by the battery manufacturer for the battery type used.

If required the IR-30EC batteries can be retorqued with about 4.4 Nm (40 inch-pounds) at maximum.

5.2.1 Tools and measurement/testing instruments

Tools and measurement instruments

The tools and test equipment that is needed to unpack the racks and to complete the installation of the *AnyMedia* optical network unit can be found in Chapter 2.4.1, Table 2-5, page 2-32.

NOTE:
The equipment and/or materials required depends on the particular installation.

5.3 Installation procedures

The following section contains the procedures for mounting the ONU to the wall.

5.3.1 Handling

Handling considerations

The shipping container is designed to lie lengthwise on the floor. You can also transport or store the containers in an upright position.

When transporting crates or storing in a warehouse, do not stack more than two containers high.

When removing containers from the shipping van, place them on a dolly truck in their horizontal shipping positions. Verify that the containers have not been damaged. It is important that all containers be handled with care and precautions be taken not to drop the units.

NOTE:
The weight of the packed ONU in its shipping container can be up to 200 kg.

WARNING: **Risk of injury due to unsecured ONU.**

The ONU can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the already installed shelves. Use a sturdy vehicle for transport and secure the ONU against being dropped. Do not store more than one packaged ONU on top of the other.

5.3.2 Uncrating

For uncrating proceed as follows:

Step	Procedure

Uncrating procedure

1. Uncrate all material in quarters separate from the equipment room in order to keep to an absolute minimum dust, lint, and other undesirable particles which could create maintenance problems.

   Comment: The ONU is shipped in a dust-protective antistatic plastic bag and placed in a wooden container or in a pasteboard box. Uncrating should be done in the shipping position.

   Requirement: The tools required for uncrating racks and shelves are standard pinch bar and claw-type hammer. Care should be exercised when uncrating so that damage to equipment does not occur. Only use the pinch bar and/or hammer in areas that have been nailed.

2. Transport the ONU near to the wall position where it has to be mounted.

NOTE:
The delivered ONU with the packaging weighs up to 200 kg.

WARNING: **Risk of injury due to unsecured ONU.**

The ONU can cause considerable injuries if it is knocked over or dropped.
This can also cause serious damage to the already installed shelves.
Use a sturdy vehicle for transport and secure the ONU against being dropped.
At least two persons are required for taking the ONU out of the packaging.

3. Cut and remove the packaging tape/strapping. Plate shears should be used to cut the metallic strapping.

4. If the packaging is a wooden box remove top cover first so that an inspection of the contents of the shipping container can be made. Remove side and end plates. The bottom plate that the ONU is resting on may remain until the ONU is brought to the ONU location for wall-mounting.

5. If the packaging is a pasteboard box open the box.

6. Remove the plastic bag and all foreign material.

7. If the packing list can be found already, put it aside for checking the delivery.

8. Lift out the ONU housing and bring it to an upright position. Two persons are required.

NOTE:
The ONU without the packaging weighs up to 25 kg.

WARNING: **Risk of injury due to unsecured ONU.**

The ONU can cause considerable injuries if it is knocked over or dropped. This can also cause serious damage to the already installed shelves. Secure the ONU against being dropped.
At least two persons are required for taking the ONU out of the packaging.

9. Make a first visual check and verify that no damage is visible.

5.3.3 Visual inspection and completeness check

Inspection and physical verification of the ONU

For visual inspection proceed as follows:

Step	Procedure
1.	Open the door of the ONU housing.
2.	Make a first visual check and verify that no transportation damage is visible, that the fan unit and the two factory installed shelves inside the ONU are secured and that there are no loose parts in the ONU. Verify that no packs are installed.
3.	Inside the ONU locate the loose parts delivered with the ONU. You must find the following: — ONU mounting bracket with 9 hexagonal or roundhead wood screws — Packing list — Drilling template — Packing with 5 GMT-type fuses 15 A (Comcode 408026243).
4.	If required take out these parts and put them in a place where they cannot get lost.
5.	Verify that the 8 blank faceplates are in slots AP-1 through AP-8 of the ONU Subshelf.

Completeness check

For a completeness check proceed as follows:

Step	Procedure
1.	Verify that the separately delivered packs and the separately packed batteries comply with the packing list.
2.	Verify that the delivered external cables comply with the packing list or use Figure 5-2, page 5-9 for checking.

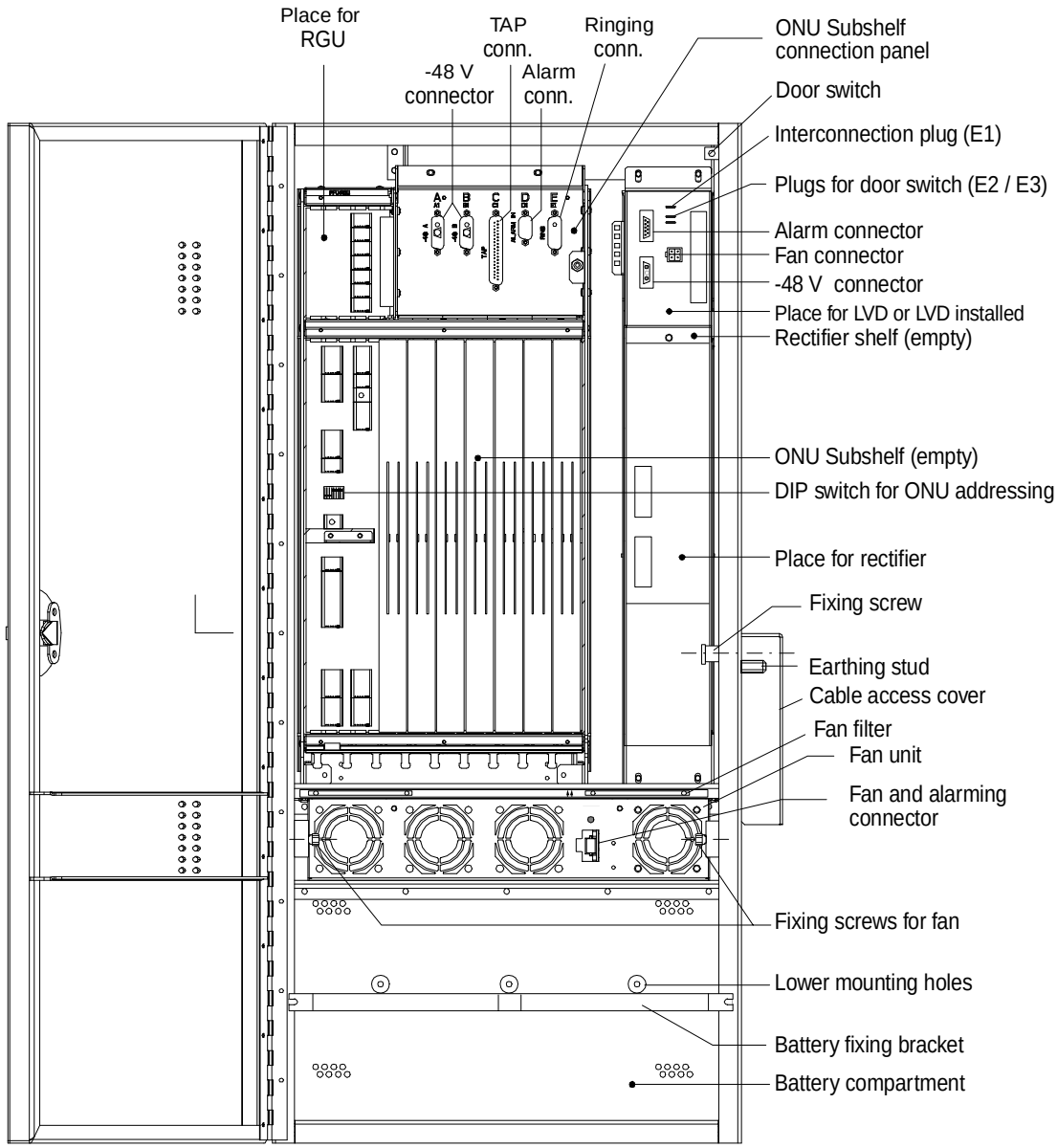
NOTE:
The AC mains cord can either be shipped loose in the battery compartment or the cord is mounted to the ONU housing already.

Step	Procedure
3.	Verify that the ONU is equipped with the ONU subshelf, the rectifier shelf and with the fan unit including the fan filter.

NOTE:
For the position of shelves or fan units to be mounted in the ONU see Figure 5-1, page 5-7.

Step	Procedure
4.	Verify that the cable access cover is mounted on the right side of the ONU.

NOTE:
If there are any problems with the equipment or equipment is missing, refer to the job specification or equipment order for the name and telephone number of the local manager to contact and rectify the problem.



Note: Cabling not shown, for delivered cabling see Figure 5-2, page 5-9.
The ONU can be delivered with the LVD already installed, not shown in this figure.

Figure 5-1 ONU as it is delivered (not all blank faceplates shown)

5.3.4 Checking the delivered internal cabling

Checking the cabling

For checking the delivered cabling proceed as follows:

Step	Procedure
1.	Verify that the factory wiring which is visible is free of broken, bent, or misaligned connectors.
2.	Verify that all factory wiring is secure and tied into forms.
3.	Verify that all cables are mounted.
4.	Verify that all connectors are connected and secured, fastening if required. For an overview of the internal cables of the ONU see the figure below.

NOTE:
Use the figure below to check the cables and where the connectors have to be connected.

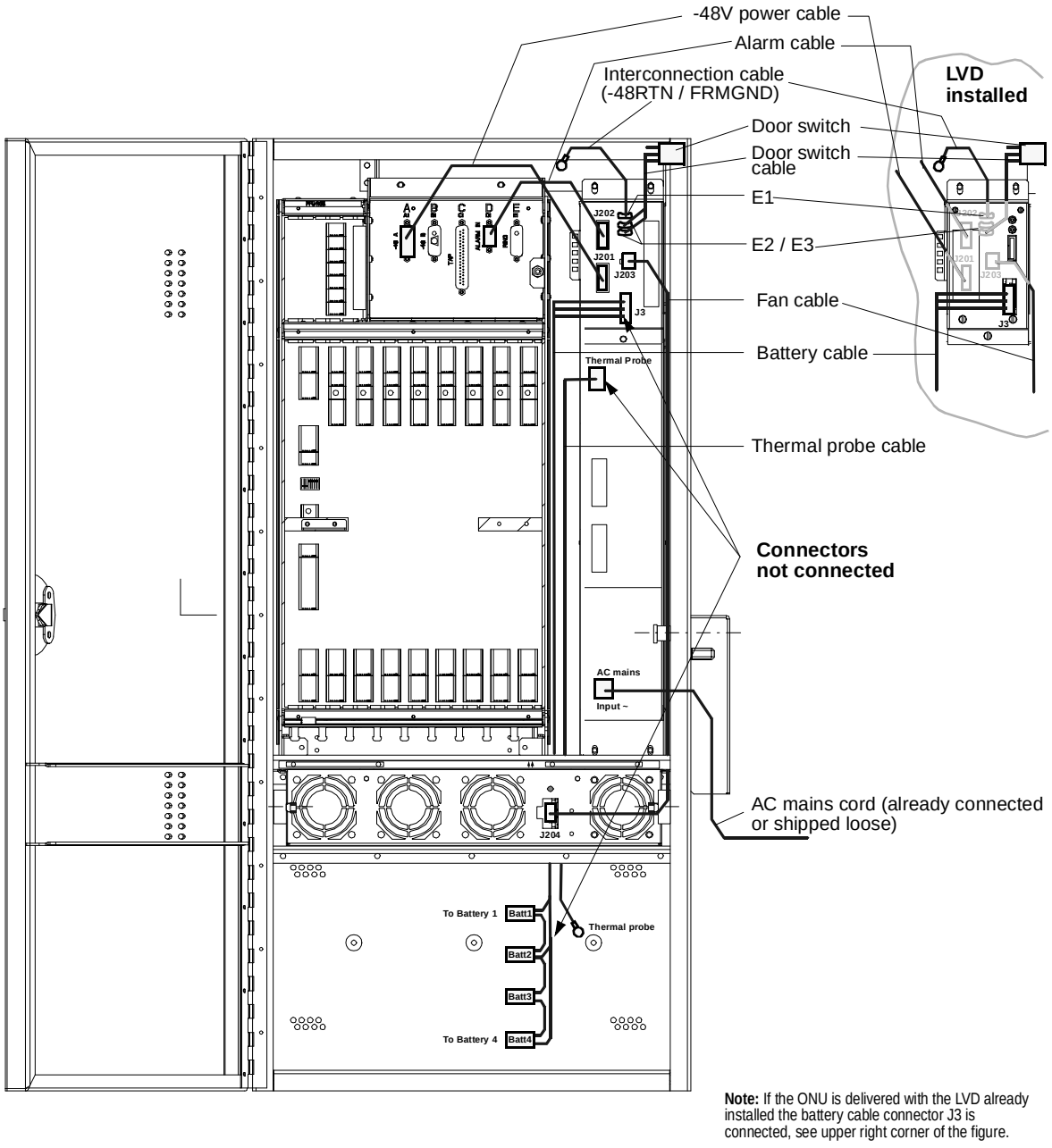


Figure 5-2 Empty ONU with cabling (which has to be checked)

5.4 Erecting and placement

5.4.1 Wall requirements

Wall preparation

Installation work for indoor applications can begin before the arrival of the *AnyMedia* Optical Network Unit (ONU) for wall-mounted indoor applications. The wall can be predrilled using a template derived from footprint figures in Chapter 5.4.3. Completion of other advance work before the arrival of the equipment (extensions for the cable rack, aisle lighting, and appliance outlets) will further reduce the installation duration.

NOTE:
For mounting to the wall ensure that the condition of the wall is able to bear the weight of the ONU. Use only anchors fitting to the wall material/condition.
For mounting to plywood board ensure that the board is about 25 mm thick at least and that the plywood board is fastened securely. The delivered wood screws are for plywood mounting.

Weight and persons required

The weight of the empty ONU will be about 25 kg. It is recommended that two persons lift the ONU.

The weight of the fully equipped ONU will be about 75 kg.

5.4.2 Wall layout and drilling

ONU wall layout

To prepare the anchoring proceed as follows:

Step	Procedure
1.	If more than one ONU has to be mounted to the same wall/plywood mark the name and number of the ONU on the wall/plywood in the space where the ONU is to be located. This will help later in locating ONU positions when the ONUs arrive. Cover the markings with a clear shellac if a period of time is expected before the arrival of the ONU so that markings do not rubb off.

NOTE:
For easy installation and servicing the required free space in front of the ONU should be at least 800 mm measured from the wall/plywood.

2. Refer to Figure 5-3 for ONU dimensions.

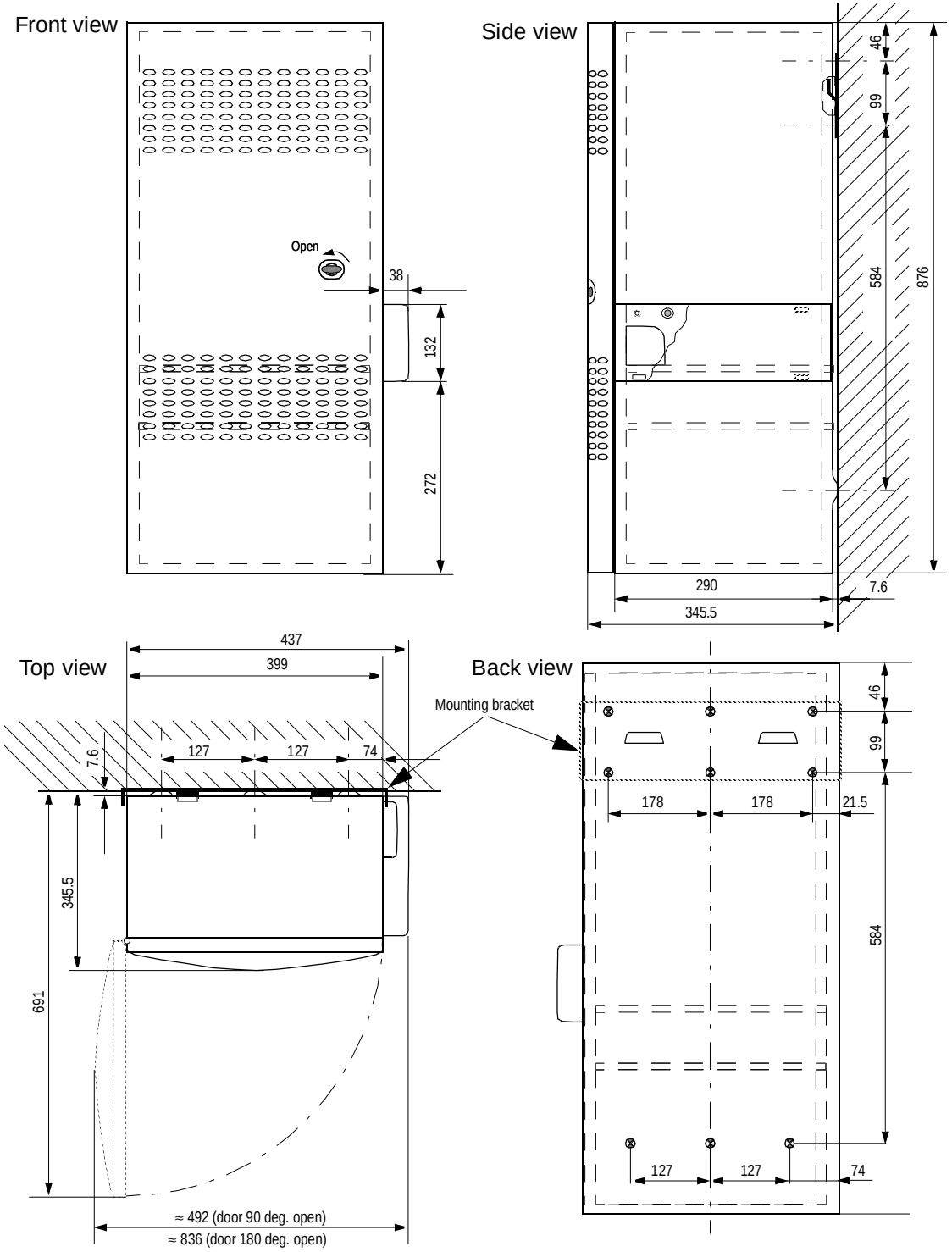
NOTE:
For wall mounting the ONU should be mounted about 900 up to 1200 mm above the ground level to ease installation and maintenance.

3. Level and attach the delivered drilling template with tape/dumb-tacks to the wall/plywood and mark the positions of the 9 holes or use Figure 5-4, page 5-13 to mark the positions of the 9 holes.

4. **For plywood-mounting:** Drill the 9 pilot holes ⊗ with diameter of about 1.5 to 1.6 mm fitting to the wood screws used.

5. **For wall-mounting:** Drill the 9 holes ⊗ with percussion drill with diameter fitting to the anchors used and clean the holes. Bring in the 9 anchors 8 x 50, refer to the drilling pattern in Figure 5-3. Ensure that the condition of the wall is able to bear the weight of the ONU. Use only anchors fitting to the wall material/condition.

6. Remove the template.



Note: Dimensions in [mm], rounded
Note: For wall mounting the ONU should be mounted about 900 up to 1200 mm above the ground level to ease installation and maintenance.

Figure 5-3 ONU mounting dimensions in [mm] and wall layout for mounting

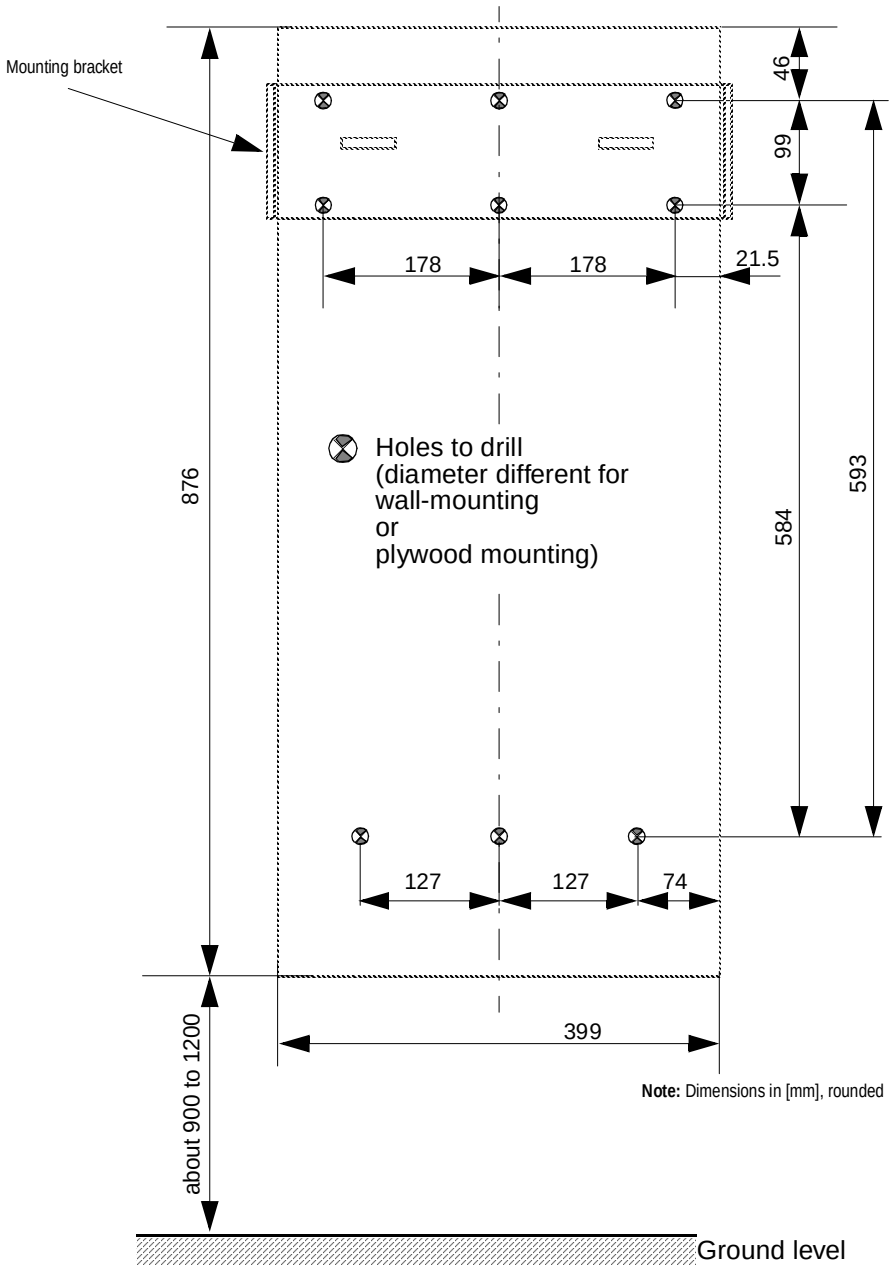


Figure 5-4 Drilling template for wall-mounting/plywood-mounting

5.4.3 Mounting and securing the ONU housing to the plywood

A set of accessories delivered with each ONU enables the ONU to be affixed to the plywood board which must have been mounted to the wall already.

The following table lists the delivered parts for plywood-mounting per ONU.

Table 5-2 Delivered parts for plywood-mounting

Item	Qty.	Description	Remark
1	1	Mounting bracket (848403937)	For plywood-mounting only
2	1	Drilling template (848487096)	
3	9	Hexagonal or roundhead wood screw	

NOTE:
For lifting the ONU two persons are required.

The following table lists the parts recommended for wall-mounting or rack-mounting.

Table 5-3 Recommended Parts for wall-mounting and rack-mounting

Item	Qty.	Description	Remark
1	1	Mounting bracket	Delivered parts
2	1	Drilling template	
3	3	Washer 6 with 12 mm outer diameter	If required
1	9	Plastic straddling anchor 8 x 50	For concrete wall-mounting only
2	9	Hexagonal or roundhead wood screw M6x60	
3	6	Washer A6	
1	9	Hexhead machine screw M6 x 25 ... 35	For rack-mounting only
2	9	Hexagonal nut M6	
3	6	Spring washer B6	

NOTE:
In all cases follow local regulations and practices for mounting. Bear in mind that the wall/rack condition must be able to bear the weight of the ONU. Use only anchors and screws fitting to the wall/rack material/condition.

The weight of the ONU completely equipped with all packs, batteries and cables is about 75 kg.

Mounting to the plywood

For lifting the ONU housing two persons are recommended. To mount the ONU proceed as follows:

Step	Procedure
1.	Transport the ONU to its proper wall location. Exercise care when moving the ONU, avoiding sudden shock or strain to equipment shelves.

NOTE:
For wall mounting the ONU should be mounted about 900 up to 1200 mm above the ground level to ease installation and maintenance

2. Level and attach the delivered mounting bracket (848403937) with the 6 hexagonal or roundhead wood screws to the plywood so that the two tabs for suspension point to the top.
For dimensions see Figure 5-3, page 5-12, for mounting see Figure 5-5, page 5-16.

NOTE:
Ensure that the wall and plywood condition is able to bear the weight of the ONU. Use only anchors and screws fitting to the material/condition. The weight of the completely equipped ONU is 75 kg.

3. Open the door of the ONU housing and hang out the door.

Weight

WARNING:

Risk of injury due to unsecured ONU.

The delivered ONU housing partly equipped -as it has to be mounted to the wall - weighs up to 25 kg.
The ONU can cause considerable injuries if it is knocked over or dropped.
This can also cause serious damage to the already installed shelves.
Use a sturdy vehicle for transport and secure the ONU against dropping.
At least two persons are required for lifting the ONU for mounting to the wall.
Always mount and lift the ONU in the unequipped state without batteries.

4. Lift the ONU housing and place it in the U-shaped mounting bracket just mounted so that the ONU towers/protrudes about 15 to 20 cm above the bracket.

5. Bring the ONU housing to a vertical position and lower the ONU housing down slowly until the ONU housing is secure on the two mounting tabs of the bracket.

6. Locate the battery bracket in the battery compartment area, remove the left mounting screw, loosen the right screw and remove the battery bracket.

7. Locate the 3 mounting holes in the lower part (battery compartment) of the ONU housing and secure the ONU housing with 3 hexagonal or roundhead wood screws.

8. Mount the battery bracket.

9. Hang in the door starting with the upper hinge pin if the installation will not continue soon.

NOTE:
An example for wall-mounting on concrete can be found in Figure 5-6, page 5-17. In all cases follow local regulations and practices.

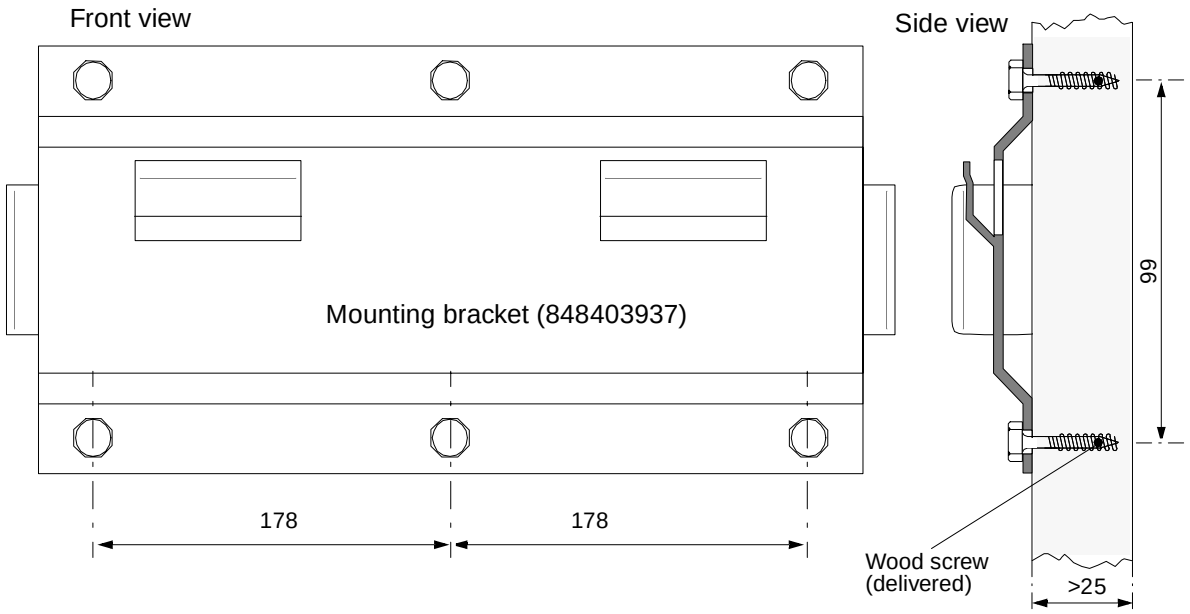


Figure 5-5 Fastening the mounting bracket for plywood-mounting

One possibility of wall fastening is illustrated in Figure 5-6 below.

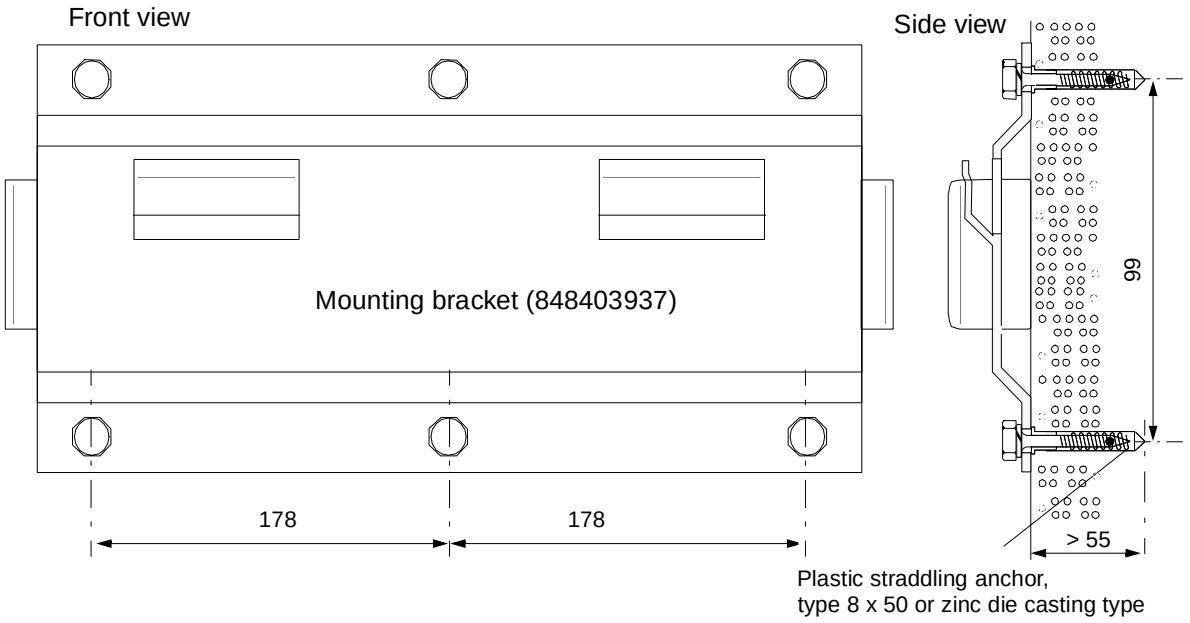


Figure 5-6 Fastening for wall-mounting on concrete

5.5 Grounding the ONU

5.5.1 Grounding overview

This section gives the steps for grounding the ONU.

The following instructions are contained in this section:

- General grounding considerations and positions of the grounding points

NOTE:
An experienced installer familiar with the ONU can jump to Chapter 5.5.4, page 5-22 and start with the grounding.

- Grounding instructions, see Chapter 5.5.4, page 5-22
- Checking the grounding, see Chapter 5.5.5, page 5-24.

5.5.2 General considerations

Environment

The *AnyMedia* optical network unit is designed to work in mesh-BN[1] or mesh-IBN[2] environments according to ETS 300 253.

Earthing

For grounding the ONU housing is equipped with an M6 grounding stud on the right side of the ONU under the cable access cover. To this stud the installer has to connect the approved earth electrode/terminal.

The ground connections to the ONU shall be made in such a manner as to ensure a low-resistance contact with the metal framework. Remove any paint if necessary.

All ground connections must have a very low impedance for an effective conduction of interference currents and for avoiding EMC interference.

The grounding connection required for each ONU housing serves several purposes:

- A direct earth ground connection for lightning protection in common bonding networks.
- A common ground potential for electrostatic discharge (ESD) protection.
- A safety ground.

Therefore, it should be the first common wiring connection established after the ONU housing has been mounted to the wall.

The ONU metalwork must always be connected to the approved earth electrode/terminal.

WARNING:

Risk of injury due to disconnected ground.

The installation must have an independent ground connection to an approved earth electrode for indoor applications. Grounding circuit continuity is vital for safe operation of the AnyMedia optical network unit.
The minimum size of the independent ground connection should be ≥6 mm^2 or ≤AWG 9.
The framework must be correctly connected to the protective earth before the start of work.
Never operate the AnyMedia optical network unit with a disconnected ground.

The following Figure 5-7, page 5-20 shows the connecting principle for powering, ringing and earthing.

Internal ground connections

The ONU Subshelf backplane and the rectifier shelf backplane will support two ground signals:

- **-48RTN** **Common** analog/digital ground signal and return path for both -48 V power feeders (-48A and -48B).
- **FRMGND** Frameground.

1 Meshed bonding network
2 Meshed isolated bonding network

The ONU Subshelf has a common ground signal used by all packs for analog and digital ground (–48RTN) which will be in common with the -48V return path. Inside the ONU Subshelf the -48RTN and FRMGND are not connected internally.

All the ONU Subshelf metalwork is connected to the ONU housing metalwork (potential frameground FRMGND) via the mounting screws, no additional green wire is necessary.

On the backplane of the rectifier shelf the -48RTN and the FRMGND are connected internally.

All rectifier shelf metalwork is connected to the ONU housing metalwork (potential frameground FRMGND) via the mounting screws, no additional green wire is necessary.

In accordance with working in mesh-BN or mesh-IBN environments the common ground signal (–48RTN) and the metalwork (FRMGRND) are connected together directly at one point inside the ONU Subshelf. Additionally an interconnection green wire connects the rectifier backplane RTN/FRMGND potential to the metalwork of the ONU housing.

The protective earth wire (PE) of the IEC 60320 AC power inlet receptacle is connected to the metalwork (FRMGND) inside the power rectifier unit (PRU).

NOTE:
For the first deliveries there are rectifiers with an IEC 320 AC inlet. These rectifiers require a power cord with the appropriate IEC 320 plug (for example the power cord 84847118).

All internal connector housings are connected to FRMGND via the mounting screws.

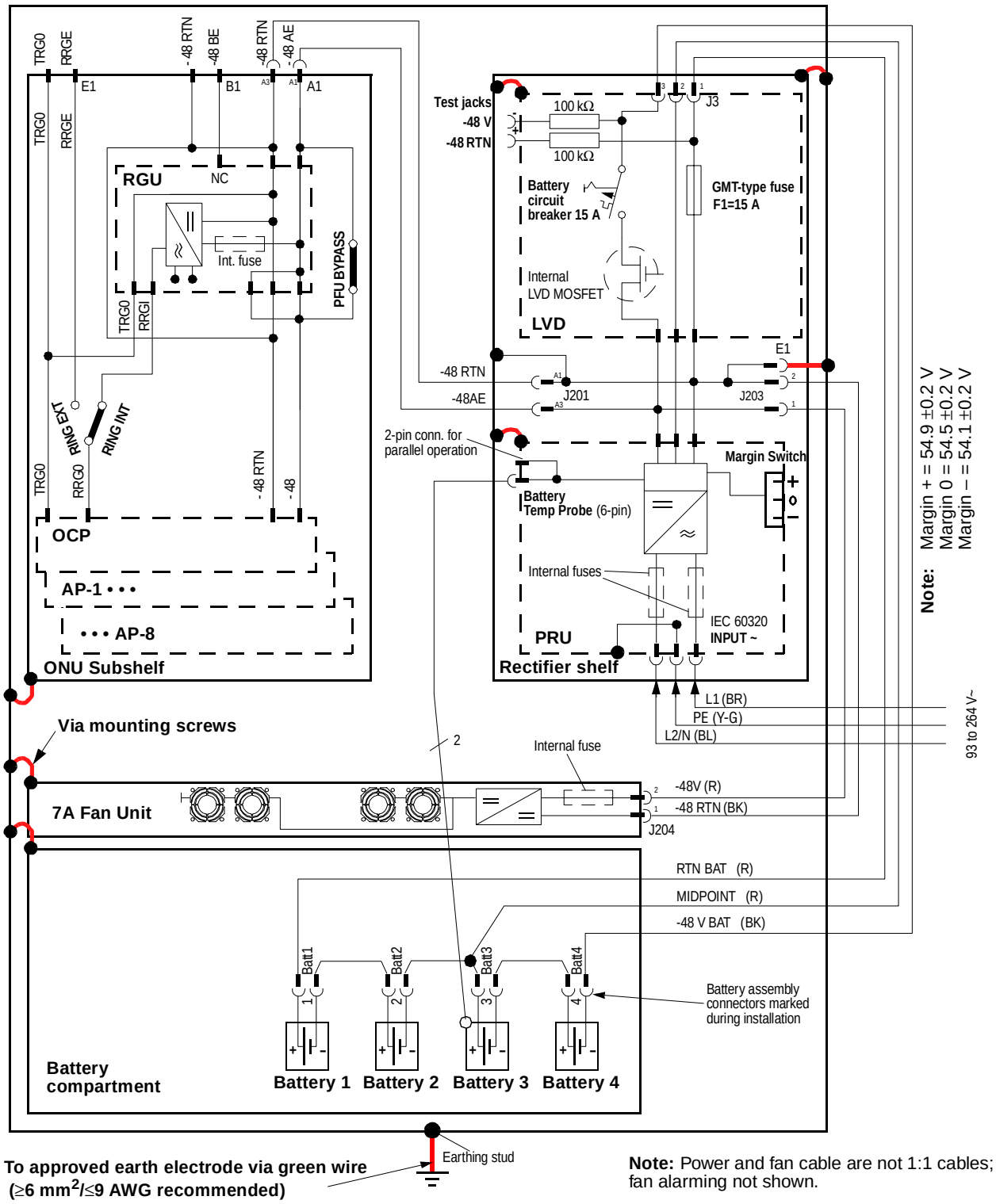


Figure 5-7 Powering, grounding and ringing for the indoor ONU

Return paths for internal powering and ringing

The standard ONU delivery variant for indoor applications will be equipped with the power rectifier unit (PRU) for -48 V and with the ringing generator unit (RGU).

The PRU is located in the rectifier shelf, the RGU is located in the ONU Subshelf.

On the backplane of the rectifier shelf the -48 V return path (-48RTN) is connected to FRMGND which is connected to the PE of the AC mains inlet. An additional green wire is used for interconnection of -48RTN and FRMGND. The wire is connected from the backplane of the rectifier shelf, blade terminal E1, to a separate earthing stud on the upper right side of the ONU housing.

The ringing return path (TRG0) is invisibly connected to the -48 V return path (-48RTN) inside the ringing generator.

5.5.3 Grounding points and ESD sockets

When delivered, one ESD socket is already mounted on the right side of the ONU Subshelf. An ESD warning label is affixed directly below the socket. Figure 5-8 shows where the sockets are mounted on the ONU.

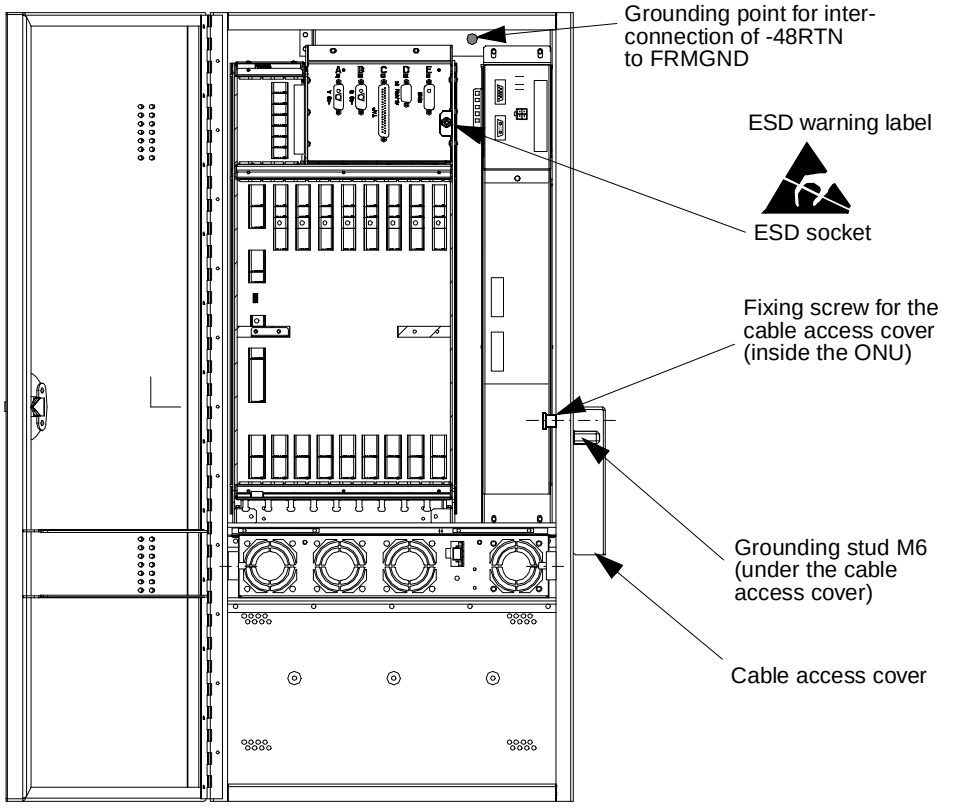

Grounding point for interconnection of -48RTN to FRMGND
ESD warning label
ESD socket
Fixing screw for the cable access cover (inside the ONU)
Grounding stud M6 (under the cable access cover)
Cable access cover

Figure 5-8 ESD socket and grounding studs/points

5.5.4 Connections

Parts for grounding

The following table lists the recommended parts for grounding the ONU.

Table 5-4 Recommended parts for grounding

Item	Qty.	Description	Remark
1	1	External toothed lock washer J6.4	Delivered and already mounted
2	1	Hexagonal nut M6	
3	1	Cable lug M6, 6 mm^2 (for example *Thomas & Betts*[a] C71 lug, terminal cable lug M6, 6 mm^2)	
4	1	Washer 6.3	
5	1	Green wire (≥6 mm^2/≤9 AWG	

a *Thomas & Betts* is a registered trademark of Thomas & Betts Corporation.

NOTE:
The wire for grounding is not part of the delivery. The wire for the bonding ring conductor/green wire (≥6 mm^2/≤9 AWG) must be delivered by the customer. The installer has to crimp the delivered cable lug to the customer's corresponding cables. No soldering is allowed.

Grounding considerations

The considerations to be observed are as follows:

- The *AnyMedia* optical network unit must be connected with grounding wire using the provided lug. It will be necessary to terminate or crimp this rack ground wire to the approved ground wire (or ground ring, bonding wire) in the building. In all cases comply with local grounding practices.

NOTE:
In all cases comply with local grounding practices. The MDF must have primary protection if the subscribers are located outside the building or the cabling is very long. In all cases, for protection follow local regulations.

Grounding procedure

The mounting for grounding the ONU is shown in Figure 5-9.

To make the connections proceed as follows:

Step	Procedure
1.	Move the cable access cover to the front for about 5 mm and remove the cover.
2.	Crimp the lug for M6 to the earthing wire on the ONU side. Soldering is not allowed.

3. The ONU housing must be connected, via the shortest route possible, to the available protective ground. The minimum cross-section of the stranded grounding cable (Cu) must be ≥6 mm^2/≤9 AWG.

4. Open the ONU door and loosen the fixing screw for the cable access cover on the right side of the ONU housing. For positions of the cable access cover see Figure 5-8, page 5-21.

5. Move the cable access cover to the front for about 10 mm and remove the cover.

6. Fasten the M6 cable lug at the earthing stud using the external toothed lock washer and the M6 hexagonal nut with torque of approximately 2 Nm, see Figure 5-9 for mounting.

7. Provide the earthing wire on the approved earth side with the connecting material matching to the earthing terminal and connect to the approved earthing point.

8. The two shelves in the ONU are connected to the ONU framework (potential FRMGND) via mounting screws. If required tighten securely all mounting screws M4 with torque of approximately 1.5 Nm.

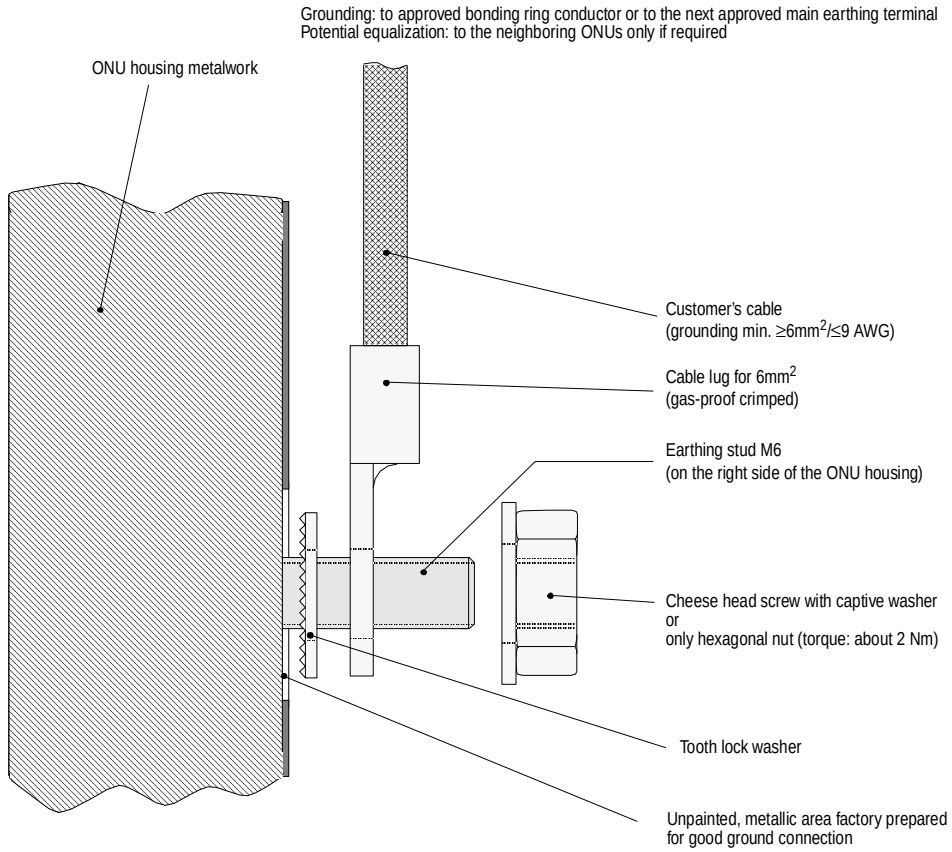

Grounding: to approved bonding ring conductor or to the next approved main earthing terminal
Potential equalization: to the neighboring ONUs only if required
ONU housing metalwork
Customer's cable
(grounding min. ≥6mm²/≤9 AWG)
Cable lug for 6mm²
(gas-proof crimped)
Earthing stud M6
(on the right side of the ONU housing)
Cheese head screw with captive washer
or
only hexagonal nut (torque: about 2 Nm)
Tooth lock washer
Unpainted, metallic area factory prepared
for good ground connection

Figure 5-9 Set of parts for grounding the ONU

5.5.5 Checking

After grounding, the connection from the framework to the bonding ring conductor and to neighboring racks must be checked/measured according to local regulations.

Therefore, before continuing the installation, check the following:

Step	Procedure
1.	Verify that no *AnyMedia* packs are inserted.
2.	The connection from the framework to the bonding ring conductor must be measured according to local regulations.

3. Ensure the electrical continuity of the connections between:

   — FRMGND (framework)
   — approved earth electrode/terminal
   — framework of adjacent ONU housings.

Cabling, wiring and assembly

6

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Cabling, wiring and assembly

6

6.1 Cabling overview

This section gives the steps for cabling the *AnyMedia*® Optical Network Unit (ONU).

The following information and instructions are contained in this section:

- General wiring and cabling informations such as:
  - — cable routing, see Figure 6-1, page 6-3
  - — AP connector insertion/removal, see Figure 6-2, page 6-5
  - — shielding information for the a/b-cable, see Figure 6-3, page 6-6
  - — schematic drawing for routing of all cables, see Figure 6-4, page 6-7 and Table 6-1, page 6-8
  - — delivered internal cabling, see Figure 6-5, page 6-10

NOTE:
An experienced installer familiar with the ONU can jump to Chapter 6.5.1, page 6-11 and start with the cabling.

- Adjustments for the ONU addressing, see Chapter 6.5.5, page 6-13
- Checking the delivered cabling, see Chapter 6.5.3, page 6-12
- Installing the TAP-B cable (optional), see Chapter 6.5.6, page 6-14
- Installing the a/b-cables to the APs and rerouting for ADSL, see Chapter 6.5.7, page 6-16 and Chapter 6.5.10, page 6-25
- Wiring for the metallic test path using the TAP100 (optional), see Chapter 6.5.9, page 6-21
- Installing the AC mains, see Chapter 6.5.11, page 6-26.

6.2 General wiring information

This section contains general wiring information for the copper cables.

Fiber

For installing and testing the fiber see Chapter 9, *Fiber test and installation*.

6.2.1 Principle of ONU cabling and cable routing

Types of cables

There are two types of cables:

- Internal cables/wiring, which connect all assembled parts within the ONU.
- External cables, which connect to parts outside the ONU housing (e.g. to main distribution frame (MDF) and to the mains).

For a more detailed description of cable types see Chapter 4.2.1, page 4-2.

Internal cables

The ONU will be delivered with all internal cabling. Most of these cables are connected to the right position. For these cables the installer has only to check that the cables are correctly fastened. For 3 cables the installer must connect the cables to the batteries and to the power rectifier unit (PRU) and to the low voltage disconnect unit (LVD) which are mounted during installation.

Addressing

After checking the delivered cabling the installer must adjust the ONU Subshelf identifier via DIP switch on the backplane. The DIP switch is front accessible.

External cables

After adjusting the ONU Subshelf identifier the installer has to bring in the optional TAP-B cable for the metallic test before the other cables are inserted.

Then the a/b-cables can be inserted and connected to the blank faceplates. The a/b-cables can be connected to the MDF. If the position of the optional TAP100 is known the cross-connections to the TAP-B cable can be made.

Finally the AC mains cord can be permanently connected to the customer's mains.

Cable routing

The figure below shows the cable routing to the ONU shelf. All external cables are routed to the right side of the ONU housing.

Protector blocks

AnyMedia Access System installations require a protected wire system which consists of gastube arrestors on all outside plant telecommunications circuits (primary protection).

Connecting cables and primary protection/protector blocks

CAUTION:

Destruction of components due to installed cables without protection.

All a/b-cables, E1-, E3/DS3, xDSL-cables and the alarming cabling should not leave the building premises unless connected to telecommunication devices providing primary protection (e.g. protector blocks with gas discharge tubes) as applicable.

Follow local regulations or regulations specified by the network provider to install protector blocks.

Lucent Technologies delivers, for example, standard circuit 4C1E-W (black) or special circuit 4C3E-W (red) protectors for the Lucent MDF.

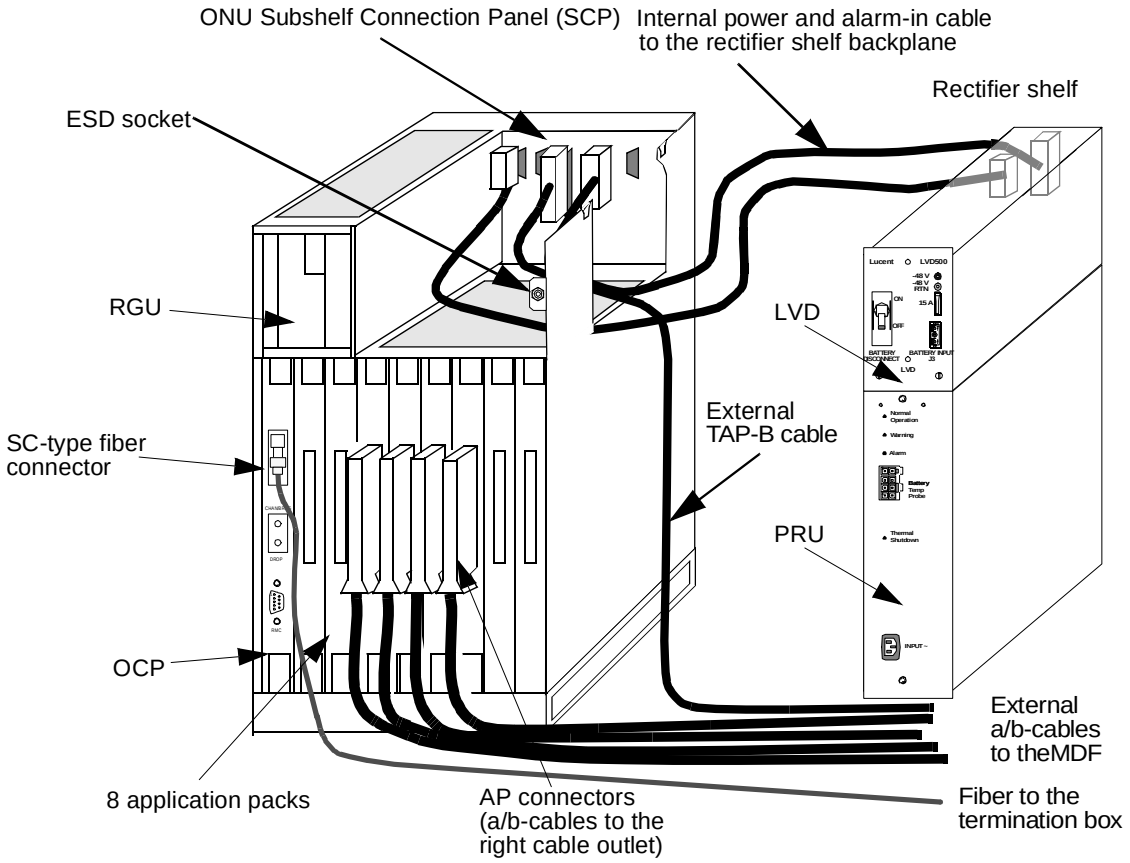


Figure 6-1 ONU Subshelf cabling arrangement for external cables

6.3 General cable description

6.3.1 Color-coding sequence for factory-assembled cables

Factory cable assembly - wire color-coding sequence

Standard wire color coding for the factory assembled cables is shown in the following tables. Use of the color coding will facilitate both terminating operations at the customer's cross-connecting points and troubleshooting routines.

For color coding see Chapter 4.2.2, page 4-3.

6.3.2 Connector types and connector assembly

The connectors employed in the system are generally of the following types:

- Application pack 68-pin connectors used for POTS/ADSL/HDSL/ISDN interface connections
- D-subminiature 3-pin connectors used for DC powering and ringing
- *Molex*[1] connectors with 2-pin, 3-pin, 4-pin and 6-pin arrangement used for connecting the fans, the batteries and the thermal probe
- D-subminiature DB9 and DB37 pin arrangements used for alarming and the metallic test path.

For a short description of connector types used for the ONU see Chapter 4.2.1, page 4-2.

6.3.3 Connecting the AP connector

The figure below shows how to insert or to remove an application pack connector at the application pack.

NOTE:
If the AP connector is attached to a blank faceplate a normal snap-in fixing is used. No ejector must be lifted or pushed down.

IMPORTANT: Disconnection of faceplate connector during connector insertion.
Do not press down on the rounded indentation on the top of the slider/ejector after connector insertion. Pressing down on the rounded indentation on the top of the slider causes the faceplate connector to disconnect.
This action affects customer service.

1 *Molex* is a registered trademark of Molex Inc.

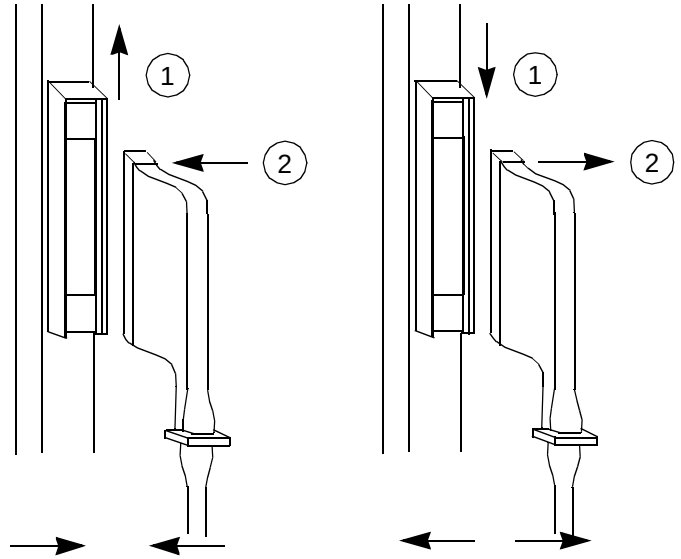


Figure 6-2 Insertion and removal of an application pack connector

6.3.4 Shielding of the AP cables

The a/b-cable is partly shielded. A braided shield is provided from the application pack connector upward to a length of about 0.6 m and is fixed with shrink tubing or by means of cable ties. In this cable area also ferrite core elements (ferrite beads) are pushed over the braided shield for better EMC shielding.

If any other cables connected to APs have an exposed braided shield then this shield must be brought in metallic contact with the grounding finger below the AP via cable ties.

Shielding

During installation the braided shield of the a/b-cable must be metallically connected correctly to the metalwork of the ONU shelf (potential FRMGND). For this reason the shelf's metalwork on the lower part is designed so that grounding bracket fingers are shaped directly below each application pack; see the following figure.

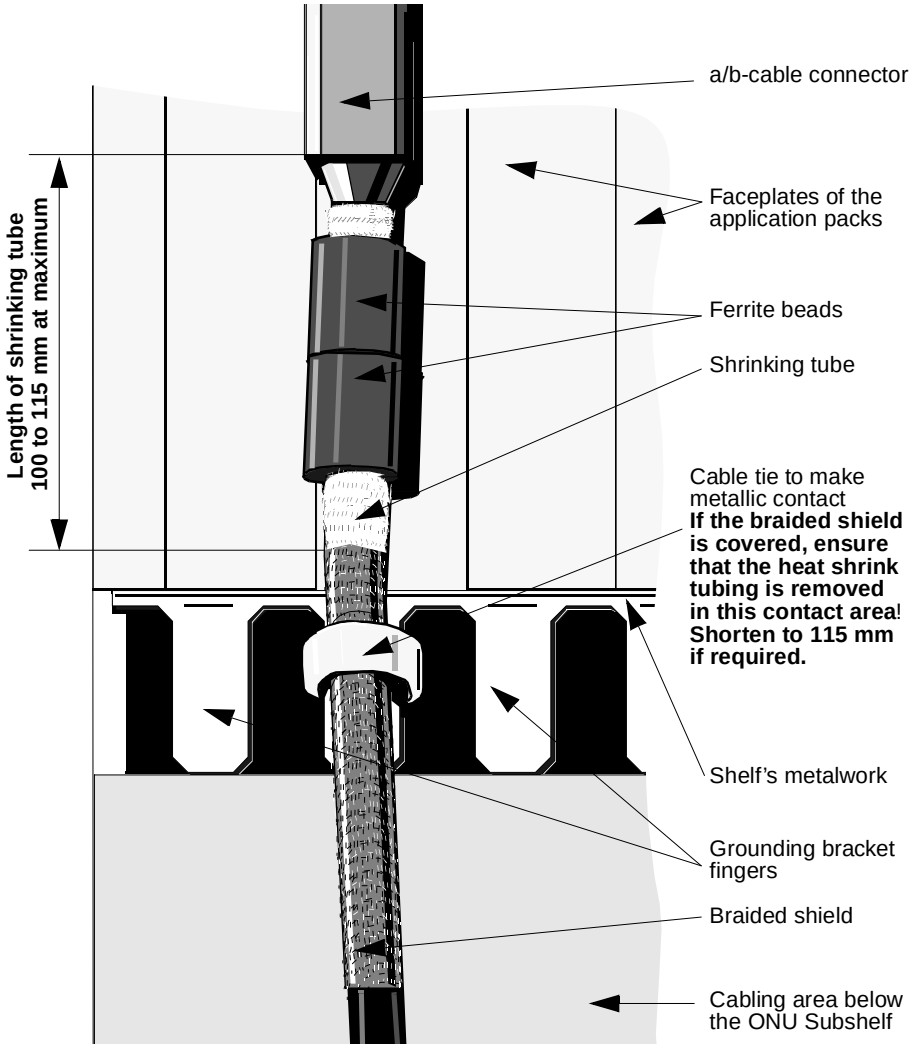

a/b-cable connector
Faceplates of the application packs
Length of shrinking tube 100 to 115 mm at maximum
Ferrite beads
Shrinking tube
Cable tie to make metallic contact
If the braided shield is covered, ensure that the heat shrink tubing is removed in this contact area! Shorten to 115 mm if required.
Shelf's metalwork
Grounding bracket fingers
Braided shield
Cabling area below the ONU Subshelf

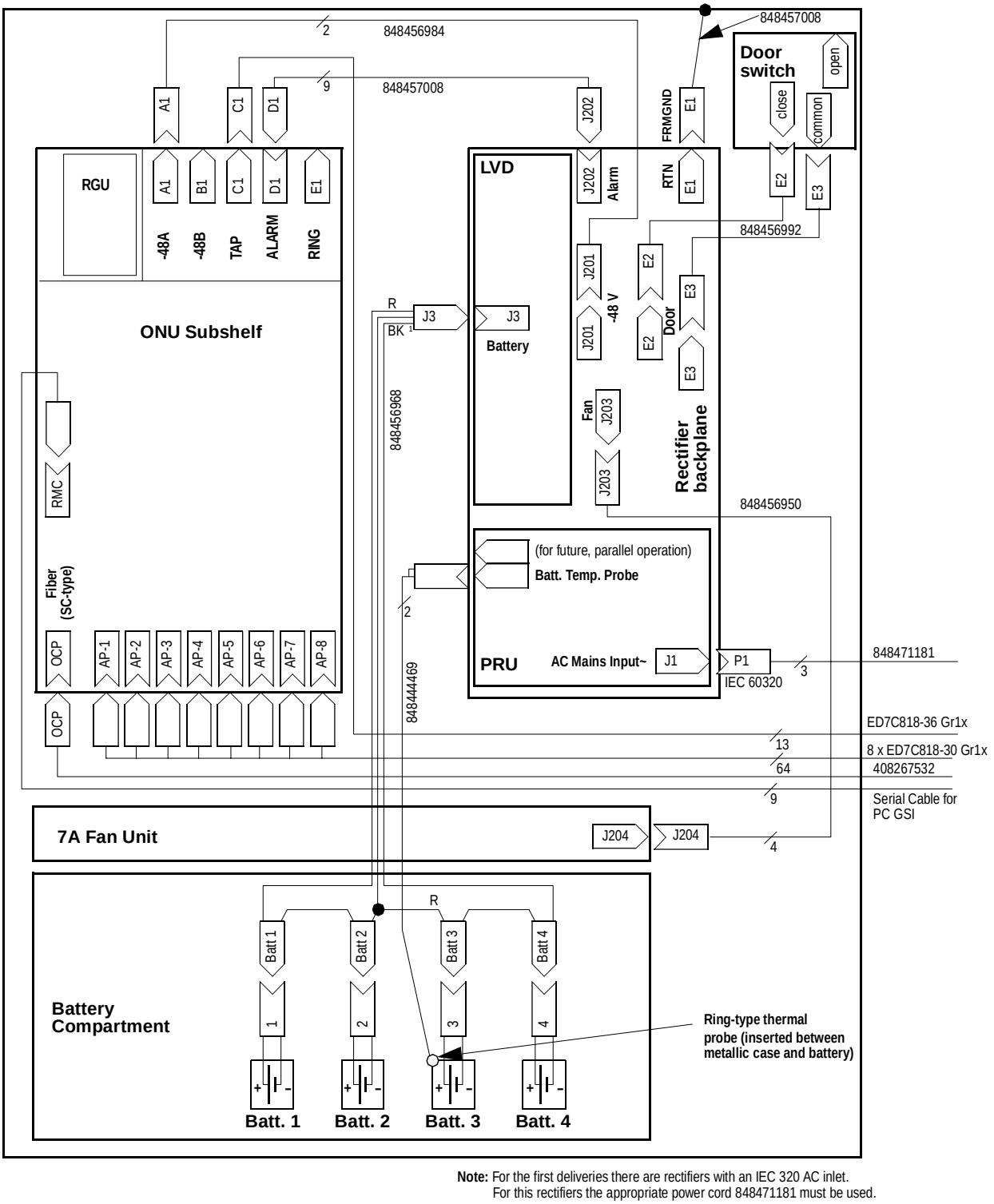
Figure 6-3 Shielding of the a/b-cable

6.4 Cabling overview

This section gives an overview of all internal and external cables of the ONU for wall-mounted indoor applications.

6.4.1 Schematic drawing for all cables

The figure below shows all cables of the ONU. The external cables which the installer has to insert and to connect are routed to the right side in the figure.



Note: For the first deliveries there are rectifiers with an IEC 320 AC inlet. For this rectifiers the appropriate power cord 848471181 must be used.

Figure 6-4 ONU cabling (complete)

Table 6-1 Cable connections for the ONU (complete)

Destination 1	Destination 2	Equipment Code or Comcode	Cable used for:
Internal cables, connected at factory			
Rectifier shelf back-plane: male J201	ONU shelf: male A1	848456984	Power cable for internal -48 V DC
Rectifier shelf back-plane: female J202	ONU shelf: female D1	848457008	Alarm cable
Rectifier shelf back-plane: male J203	7A fan unit: male J204	848456950	Fan cable
Rectifier shelf back-plane: E2, E3 (plug)	Door switch: the two lower plugs E2, E3	848456992	Intrusion door switch cable
Rectifier shelf back-plane: E1 (plug)	Inside ONU housing: upper M6 grounding stud	848467189	Interconnection wire (FRMGND - 48VRTN)
Internal cables, delivered, which have to be connected during installation			
LVD: female J3	Battery dangler cable connectors (female) for battery 1 to 4	848456968	Battery set cable [a]
Rectifier unit: male IEC 320 AC mains inlet Input~	Customer's mains, open end (for fixed interconnection) **Must fit to the appropriate rectifier, see footnotes.**	848471181 Issue 1	AC mains power cord[b] 3 m (≈10 feet)
Rectifier unit: male IEC 60320 AC mains inlet Input~		848506820	AC mains power cord[c] 3 m (≈10 feet)
Rectifier unit: male battery temp. probe connector	Ring-type thermal probe inserted between the metallic case and plastic housing of battery 3	84844446	Thermal probe
External cables, prefabricated, which have to be routed and to be connected during installation[d]			
ONU shelf: AP-1 to AP-8 (also for optional TAP100)	MDF	ED 7C818-30Gr1x	a/b wires, Lucent standard cable 50 ft. to 300 ft. (≈ 15 m to 91.5 m)
ONU shelf: male C1 (option)	MDF	ED 7C818-36Gr1x	TAP-B cable for ONU shelf 50 ft. to 300 ft. (≈ 15 m to 91.5 m)

Table 6-1 Cable connections for the ONU (complete) –*Continued*

Destination 1	Destination 2	Equipment Code or Comcode	Cable used for:
Fiber cable, prefabricated, which have to be routed and to be connected during installation[e]			
ONU shelf: OCP, SC connector	Fiber termination box: SC connector	408267532	Fiber jumper cable with SC/SC connector
External cable, customer-made (not delivered), which has to be make and has to be routed and to be connected during installation			
M6 stud on the right side panel of the ONU under the cable access cover via cable lug	Earth: approved earth terminal/green wire	external (cable lug for 6 mm^2 / M6 is required)	Earthing and grounding

a Not connected, batteries and LVD will be mounted during installation.

b Can only be used with the S1:1 rectifier with the IEC60320 inlet! The cable is not connected, the S1:1 rectifier will be mounted during installation. Connection to customer's mains after installation.

c Can only be used with the older rectifier with the IEC320 inlet! The cable is not connected, the rectifier will be mounted during installation. Connection to customer's mains after installation.

d Most of the ED...Gr**x** cables are orderable with the following length: from 50 ft. up to 300 ft. (from ≈ 15 m up to ≈ 91.5 m).

e The fiber cable is equipped with an SC-type connector at each end.

6.4.2 Internal delivered cables

The internal cables which the installer has to check are shown in the figure below.

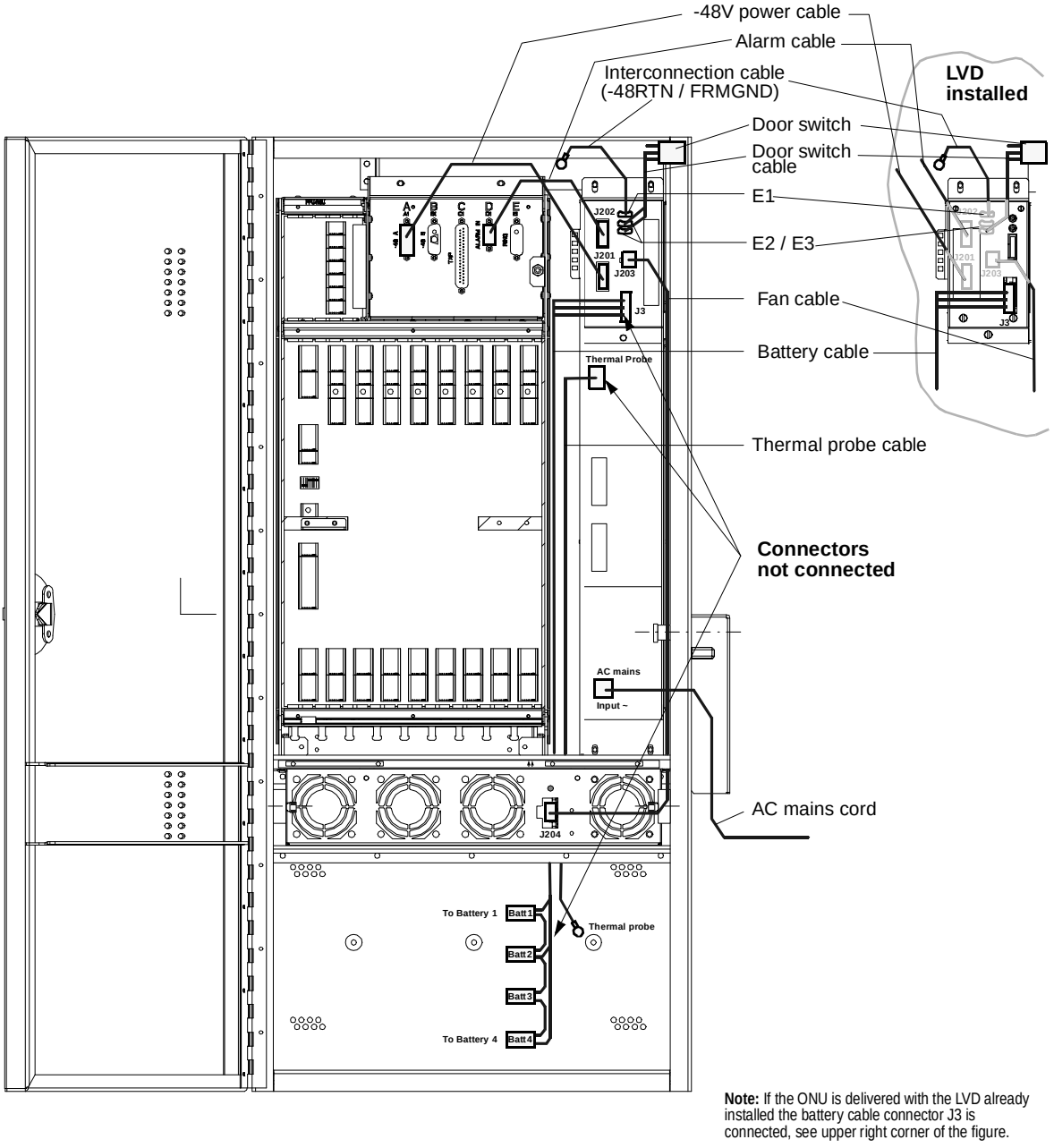


Figure 6-5 Empty ONU with delivered cabling

6.4.3 External cables

The external cables which the installer has to insert and to connect are the cables which are routed to the right side in Figure 6-4, page 6-7. The grounding connection has already been made, see Chapter 5.5.4, page 5-22.

6.5 Installation and wiring

The following section describes the installation of the cables from checking the internal cables to installing AC mains.

If not yet done already the grounding and the delivered cabling should be checked.

6.5.1 Preparing the ONU for cabling

At the start of the cabling procedure the ONU door must be opened and the cable access cover on the right side of the ONU housing must be removed temporarily.

Step	Procedure
1.	Open the door of the ONU. If desired the door can be lifted up and removed.
2.	If the cable access cover is already removed go to Chapter 6.5.2, page 6-11 and proceed.
3.	Locate the fixing screw for the cable access cover inside the ONU on the right side and loosen.
4.	Move the cover about 0.5 cm to the front so that the fixing noses of the cover become free. Now the cover can be removed to the right.
5.	Put the cover aside for later installation.

6.5.2 Checking earthing and grounding

Before continuing the installation, check the following:

Step	Procedure
1.	Verify that no *AnyMedia* plug-ins are inserted.
2.	The connection from the framework to the approved earthing terminal must be measured according to local regulations.
3.	Ensure the electrical continuity of the connections between:

— FRMGND (framework)

— approved earth conductor/terminal to which the grounding wire is connected

— framework of adjacent ONU housings if mounted.

6.5.3 Checking internal, delivered cabling

If not already done refer to Chapter 5.3.3, page 5-5 to check the internal cabling. For the connector positions and the cables which have to be checked use Figure 6-4, page 6-7 and Table 6-1, page 6-8.

6.5.4 Inventory data of the ONU Subshelf

Inventory data

The ONU shelf is equipped with 1 to 4 resistors of 0 Ω on the backplane representing the shelf inventory data.

No action is required for adjusting. The ONU shelf is always factory equipped with resistors for the correct setting. The representing value for the ONU is 9.

The figure below shows the location of the resistors and also the position of the DIP switch for ONU addressing.

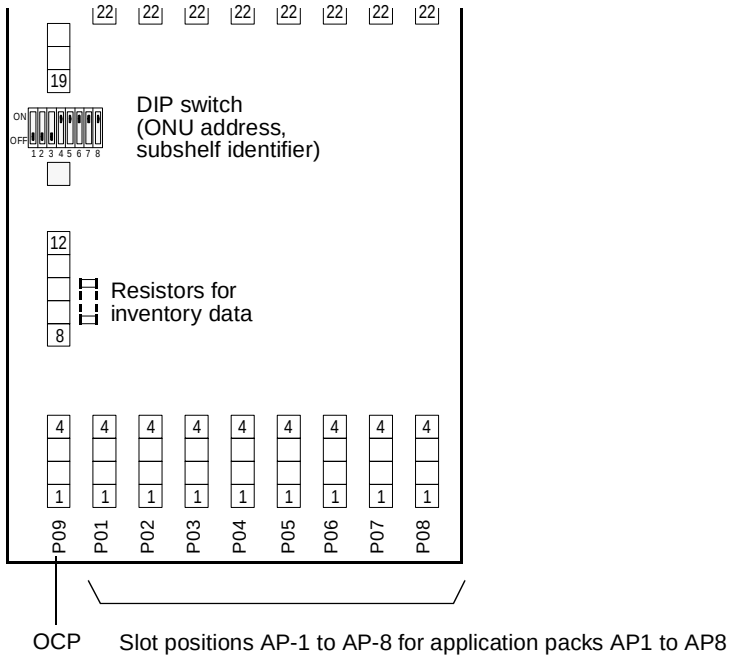


Figure 6-6 ONU backplane arrangement as viewed from front (no pack inserted)

6.5.5 Preparing the ONU with the ONU Subshelf identifier

ONU addressing via DIP switch

The ONU shelf is equipped with a DIP switch with 8 switches. The DIP switch is located on the ONU backplane near the position where the OCP has to be inserted. The DIP switch is front accessible if the OCP is not inserted.

The switches are in the ON position if the appropriate switch is moved to its upper position (on the switch marked "ON").

Step	Procedure
1.	If required remove the blank faceplates of the slots AP-1 to AP-4.
2.	Locate the DIP switch inside the ONU shelf on the left side of the backplane. Switch the 8 switches to ON/OFF as stated in the engineering work order using a very small screwdriver. The switches are inverse binary coded. The address adjustments for the ONU Subshelf identifiers 1 to 8 can be found in Figure 6-7, page 6-14.

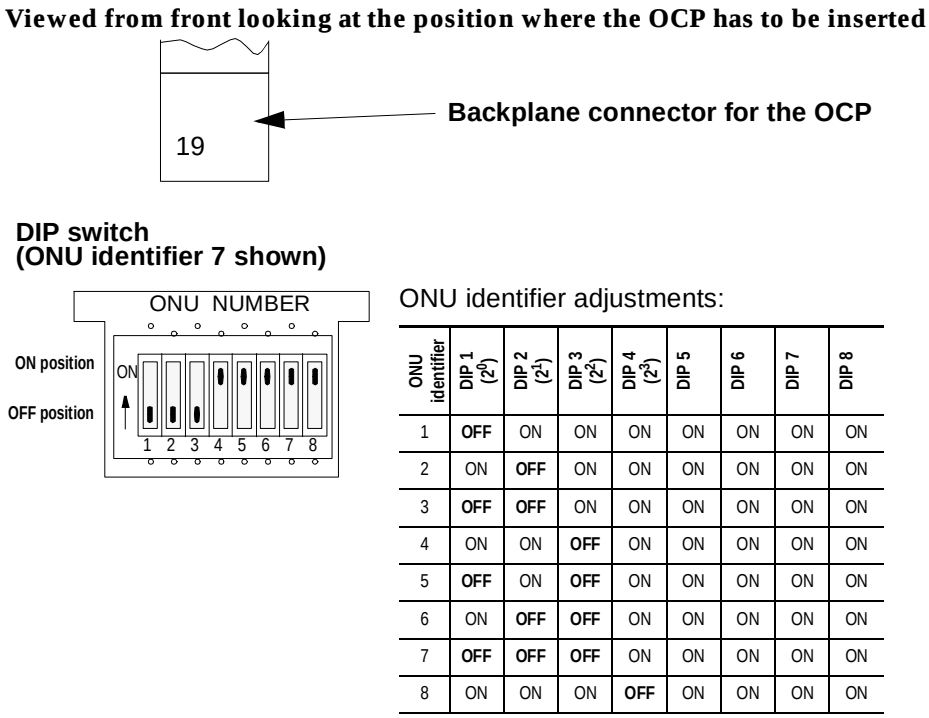
Broken backplane

IMPORTANT:

Broken or bent backplane connector due to reduced space
Take care during the adjusting that no connectors on the backplane or the DIP switch are bent or broken.

3.	Check the adjusted ONU address carefully because a later correction is difficult due to the reduced space by the installed and cabled application packs.
4.	Insert the blank faceplates which have been removed temporarily.

The following figure shows the adjustments for the ONU Subshelf identifiers 1 to 8.


Viewed from front looking at the position where the OCP has to be inserted
19
Backplane connector for the OCP
DIP switch
(ONU identifier 7 shown)
ONU NUMBER
ON position
OFF position
ON
1 2 3 4 5 6 7 8

ONU identifier adjustments:

ONU identifier	DIP 1 (2^0)	DIP 2 (2^1)	DIP 3 (2^2)	DIP 4 (2^3)	DIP 5	DIP 6	DIP 7	DIP 8
1	**OFF**	ON	ON	ON	ON	ON	ON	ON
2	ON	**OFF**	ON	ON	ON	ON	ON	ON
3	**OFF**	**OFF**	ON	ON	ON	ON	ON	ON
4	ON	ON	**OFF**	ON	ON	ON	ON	ON
5	**OFF**	ON	**OFF**	ON	ON	ON	ON	ON
6	ON	**OFF**	**OFF**	ON	ON	ON	ON	ON
7	**OFF**	**OFF**	**OFF**	ON	ON	ON	ON	ON
8	ON	ON	ON	**OFF**	ON	ON	ON	ON

Figure 6-7 DIP switch for ONU addressing (on the OCP position)

6.5.6 Installing the TAP-B cable (option)

Overview

This procedure consists of installing the external prefabricated TAP-B cable (ED7C818-36 Group 1x) and connecting its 37-pin connector to connector C1 (TAP) on the *AnyMedia* shelf connection panel. The other end must be connected to the MDF according to local conditions and requirements of the network provider for providing the metallic test path.

Reduced space for TAP-B cable installation

IMPORTANT:

TAP-B cable connector cannot be inserted

The TAP-B cable must be installed at first because already installed a/b-cables reduce the ONU cable opening so that the TAP-B cable connector cannot be inserted.

If the TAP-B cable must be installed after the a/b-cables have been installed the TAP-B cable connector housing must be removed temporarily or the cable must be installed with its open end from inside the ONU towards the MDF.

NOTE:

Not all pins on this 37-pin connector are connected, only 4 wires of this 13-wire cable are required for integrated drop testing and monitoring. These wires have to be connected to the 4 wires (Z port 1 and Z port 2) of

the TAP100 cable; for a connecting example see Table 6-4, page 6-24. The fifth wire is reserved for future use (seizing).

Connector pinning

The pinning of the TAP connector for the TAP-B cable is shown in Figure 4-8, page 4-12. By way of example Table 6-4, page 6-24 shows the connections to the MDF.

Cable length

The TAP-B cable is available in varying lengths, however any excess may be cut off to relieve cable rack congestion.

Table 6-2 Length of TAP-B cable (ED7C818-36, Group 1x)

Description	Code	Length
TAP-B Cable	ED7C818-36, Group 1	50 ft. (≈ 15 m)
	ED7C818-36, Group 1A	100 ft. (≈ 30.5 m)
	ED7C818-36, Group 1B	200 ft. (≈ 61 m)
	ED7C818-36, Group 1C	300 ft. (≈ 91.5 m)

Installing and attaching the TAP-B cable

The cable should be installed in the following order.

Step	Procedure
1.	Verify that no a/b-cable is installed already.
2.	Pull the TAP-B cable assembly with its connector end through the right-hand side of the ONU opening. Route it along the bottom of the rectifier shelf to the gap between the rectifier shelf and the ONU shelf.
3.	Lead the cable in the gap upwards through the right opening of the ONU shelf to the 37-pin, male connector C1. For cable routing of the ONU shelf see Figure 6-1, page 6-2.
4.	Add cable ties to the rectifier shelf as needed to fix the TAP-B cable.
5.	Mate the TAP-B connector with connector C1 of the ONU shelf.
6.	Check the correct labeling on the cable connector and mark if required. Mark the other cable end in the direction of the MDF with the same label designation.
7.	Connect the TAP-B cable to the MDF according to local regulations or according to the instructions given by the network provider.

NOTE:
The TAP-B cable is a 13-wire cable of which only 5 wires are used. Four of them are for the circuit pair and the drop pair of the metallic test path. The

fifth one is for future use. For the cabling/interconnections of the metallic test path see Chapter 6.5.9, page 6-21.

8. Terminate the tip/ring pairs at the MDF and check the labeling. Note the wire color-coding sequence of the factory-prepared cable assemblies to facilitate the terminations.

Testing the connections to the MDF

The testing should be done according to local regulations. A recommended practice for the Lucent MDF is as follows:

Step	Procedure
1.	Use the ITE-6675 Streak Mate and ITE-7079 AIU Test Fixture to test the installed TAP-B cable. *Requirement:* No open or shorted wires or tip ring reversals.

6.5.7 Installing a/b-cables

Overview

The procedures below consist of installing the external prefabricated a/b-cables (ED7C818-30 Group 1x) used for POTS, ISDN, HDSL and/or ADSL and connecting their connectors to the ONU shelf blank faceplates (C 847773389) which have been furnished as part of the ONU shelf delivery. The other end must be connected to the MDF according to local conditions or requirements of the network provider.

Sometimes the a/b-cable is also named the T/R-cable or VF-cable.

Cable length

The a/b-cable is available in varying lengths, however any excess may be cut off to relieve cable rack congestion.

Table 6-3 Length of a/b-cables (ED7C818-30, Group 1x)

Description	Code	Length
a/b-cable (32 wire pairs)	ED7C818-30, Group 1	50 ft. (≈ 15 m)
	ED7C818-30, Group 1A	100 ft. (≈ 30.5 m)
	ED7C818-30, Group 1B	200 ft. (≈ 61 m)
	ED7C818-30, Group 1C	300 ft. (≈ 91.5 m)

Cable marking; labeling

If not factory prepared all a/b-cable connectors should be marked by hand by the installer/customer in accordance with the route/system numbering scheme. The MDF circuit labeling should follow this numbering pattern.

Installing and attaching the a/b-cables

The a/b-cables should be installed in the following order.

Step	Procedure
1.	Pull the first a/b-cable with its connector end through the right-hand side of the ONU opening and route the cable along the bottom of the ONU shelf to the AP-1 position. Orient the mating cable connector so that the a/b-cable exits upwards towards the application pack. For cable routing of the ONU shelf see Figure 6-1, page 6-3.

NOTE:
How many a/b-cables have to be installed and to which AP position they have to be routed is stated per ONU shelf in the engineering work order or must be given by the network provider. 96 subscribers can be connected to the ONU at maximum. For positions of the APs see Figure 6-9, page 6-19.

2. Stamp or mark the cable connector before mating to its associated AP connector. Mark the other cable end in the direction of the MDF with the same label designation.

3. Snap in the cable connector to the blank faceplate. If APs are already installed you must lift the ejector of the AP first before you can connect. Refer to Figure 6-2, page 6-5 for how to remove or insert an AP connector.

4. Arrange the a/b-cable so that the a/b-cable reaches the grounding bracket fingers of the ONU shelf directly below the application pack.

NOTE:
The a/b-cable is of the partly shielded type. An additional braided shield is provided from the application pack connector upward to a length of about 0.6 m and is fixed with shrink tubing or by cable ties.

5. Put the a/b-cable flush against the grounding bracket finger, so that the braided shield is in good metallic contact with the bracket.

NOTE:
If the shrink tubing is too long so that the braided shield is covered in the grounding finger area shorten the shrink tubing as stated in Figure 6-3, page 6-6.

6. Snap a cable tie over the cable and the grounding bracket and fasten together, ensuring good strain relief; see also Figure 6-3, page 6-6.

7. Carefully place the cables into the bottom of the ONU Subshelf so that eight cables will fit in this area and allow the application packs to be removed.

8. Repeat Step 1. to 7. for each a/b-cable.

9. Carefully push each a/b-cable to the bottom and add cable ties as needed, see figure below.

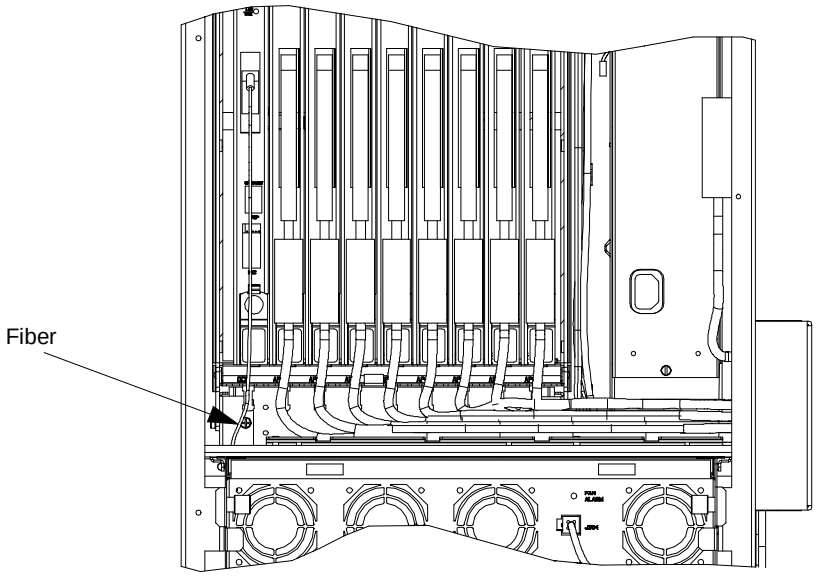
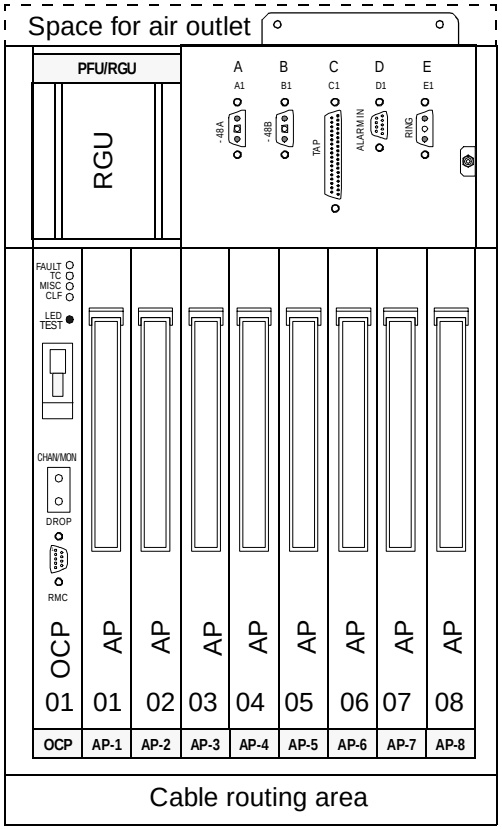


Figure 6-8 Cable routing below the ONU Subshelf

10. Terminate the tip/ring pairs at the MDF for all installed a/b-cables and check the labeling of the cables, connectors, and the conductors in accordance with the figures for connectors of AP1 to AP8. Note the wire color-coding sequence of the factory-prepared cable assemblies to facilitate the terminations. For the AP connector pinning refer to Figure 4-18, page 4-26 up to Figure 4-27, page 4-35.

NOTE:
96 narrowband subscribers can be connected to the ONU at maximum.

NOTE:
If the AP cables are connected via the MDF to subscribers outside the building the MDF must be equipped with protector blocks **and** the MDF must be connected to an approved earthing terminal via a separate wire of ≥6 mm^2 (≤9 AWG) at least.



Positions to plug in:

Pack	Position
POTS	AP1-8
ISDN	AP1-8
HDSL, SHDSL	AP1-8
TAP100 (1x)	AP1-8
xDSL	AP1-8
OCP	OCP (1)

Figure 6-9 Plug-In arrangement and connector arrangement of the ONU Subshelf

Testing the MDF

The testing should be done according to local regulations. A recommended practice for the Lucent MDF is as follows:

Step	Procedure
1.	Use the ITE-6675 Streak Mate and ITE-7079 AIU Test Fixture to test the installed cables. *Requirement:* No open or shorted wires or tip ring reversals.
2.	Repeat step 1 for each a/b-cable.

Protector blocks

AnyMedia Access System installations require a protected wire system which consists of gastube arrestors (gas discharge tube, GDT) on all outside plant telecommunications circuits (primary protection). Follow local regulations or regulations specified by the network provider to install protector blocks.

6.5.8 Marking the TAP100 cable (option)

Overview

The TAP100 cable is only required if the test application pack TAP100 is installed (option).

For the TAP100 cable one of the a/b-cables is used which have been installed and connected to the cross-connect already.

For marking proceed as follows:

Step	Procedure
1.	If the slot for the TAP100 plug-in is known mark the appropriate a/b-cable on the MDF.
2.	Locate the 4 wires for Z port numbers 1 and 2 (tip and ring wire of subscribers 1 and 2) and mark them.

NOTE:
Only these 2 ports are used by the TAP100 for the test application path B. These 4 terminals have to be connected to the TAP-B cable, which runs from the ONU, connector C1 (TAP), to the MDF. On the TAP-B cable 5 wires are used for the test application path B where the fifth wire is reserved for future use (seizing). For crossconnecting see also .

3.	If cross-connections exist for these two ports to the distribution side and subscribers are connected remove these four cross-connections between the feeder and subscriber side if the cross-connect is located in the same building.
4.	If cross-connections exist for these two ports to the distribution side and subscribers are connected remove the four subscribers if the cross-connect is located outside of the building.
5.	Continue with making the four cross-connections which are described in the chapter below. If the MDF is located inside the building the cross-connections should be made on the feeder side of the cross-connect, see Figure 6-10, page 6-22. If the MDF is located outside the building the a/b-cable coming from the TAP100 should have primary protection. The cross-connections should be made via the distribution side using the protector blocks of the a/b cable, see Figure 6-11, page 6-23. Follow local regulations or regulations specified by the network provider to install protector blocks.

The cross-connections which the installer has to make are described in the chapter below.

6.5.9 Interconnections of test application paths (option)

TAP principle

The optional Test Application Pack (TAP100) is the internal test head executing the measurements required for the drop.

Each AP can switch any of its subscribers to the General Purpose Bus (GPB). The subscriber can be switched either bridged (connection between port and subscriber line is kept) or split (connection between port and subscriber line is opened) to the GPB.

The TAP-B cable is a 13-wire cable of which only 5 wires are used. Four of them are for the circuit pair and the drop pair. The fifth one is for future use.

The TAP100 cable is a normal 64-wire a/b-cable of which only 4 wires are used (Z port numbers 1 and 2).

Figure 6-10, page 6-22 illustrates the cabling of the test bus for a cross-connect located in the same building, Figure 6-11, page 6-23 illustrates the cabling of the test bus for a cross-connect located outside the building, Table 6-4 shows the internal connections between these 4 wires.

The subscriber lines of the application packs are numbered from 1 to 256 per ONU shelf. AP8 therefore would use terminals 225 to 256, the TAP-B cable would use terminals 257 to 271 for example. Nevertheless only 96 narrowband subscribers can be served by the ONU.

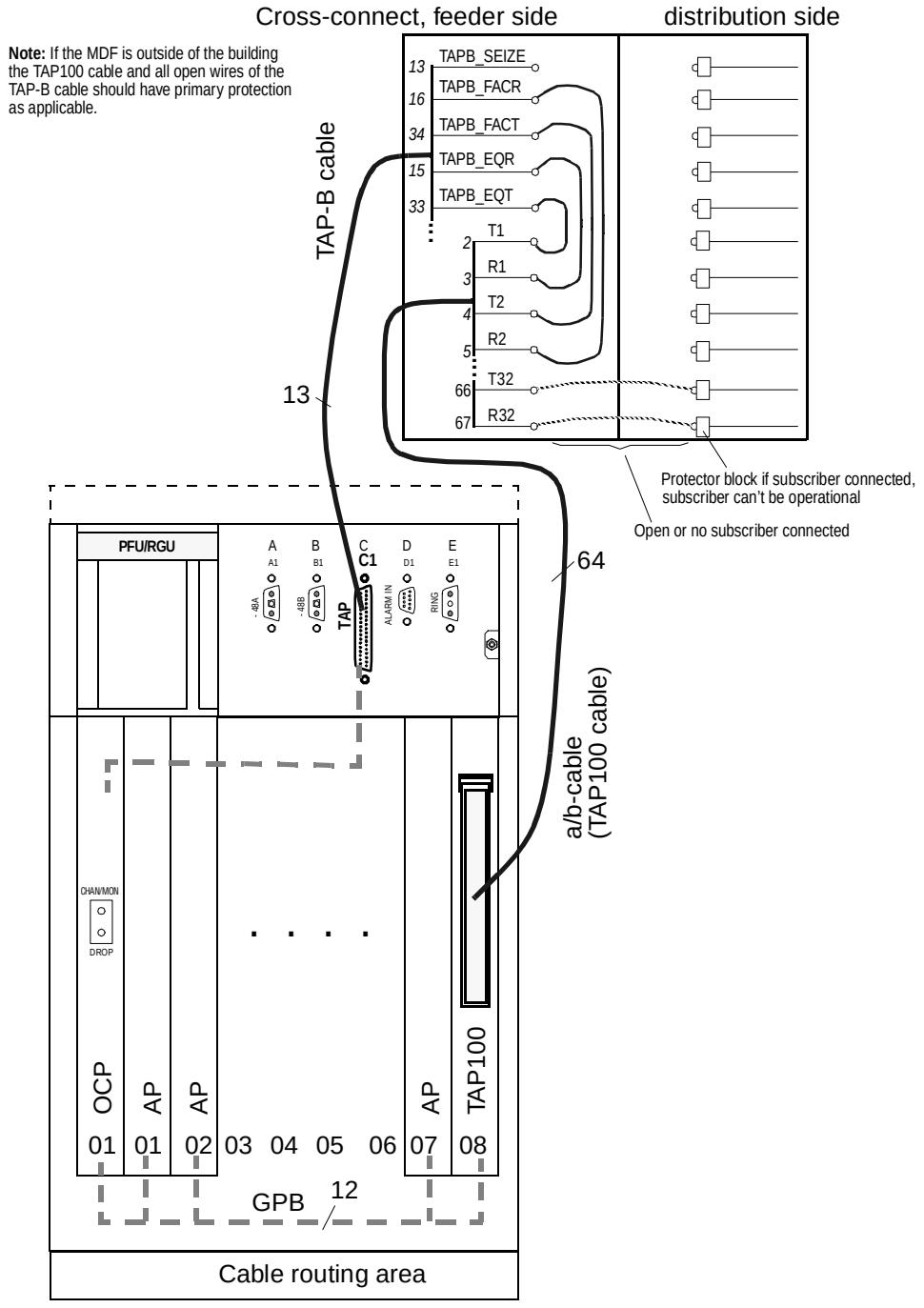


Figure 6-10 Cabling for integrated testing with TAP100 inserted in slot position AP-8 for colocated cross-connect

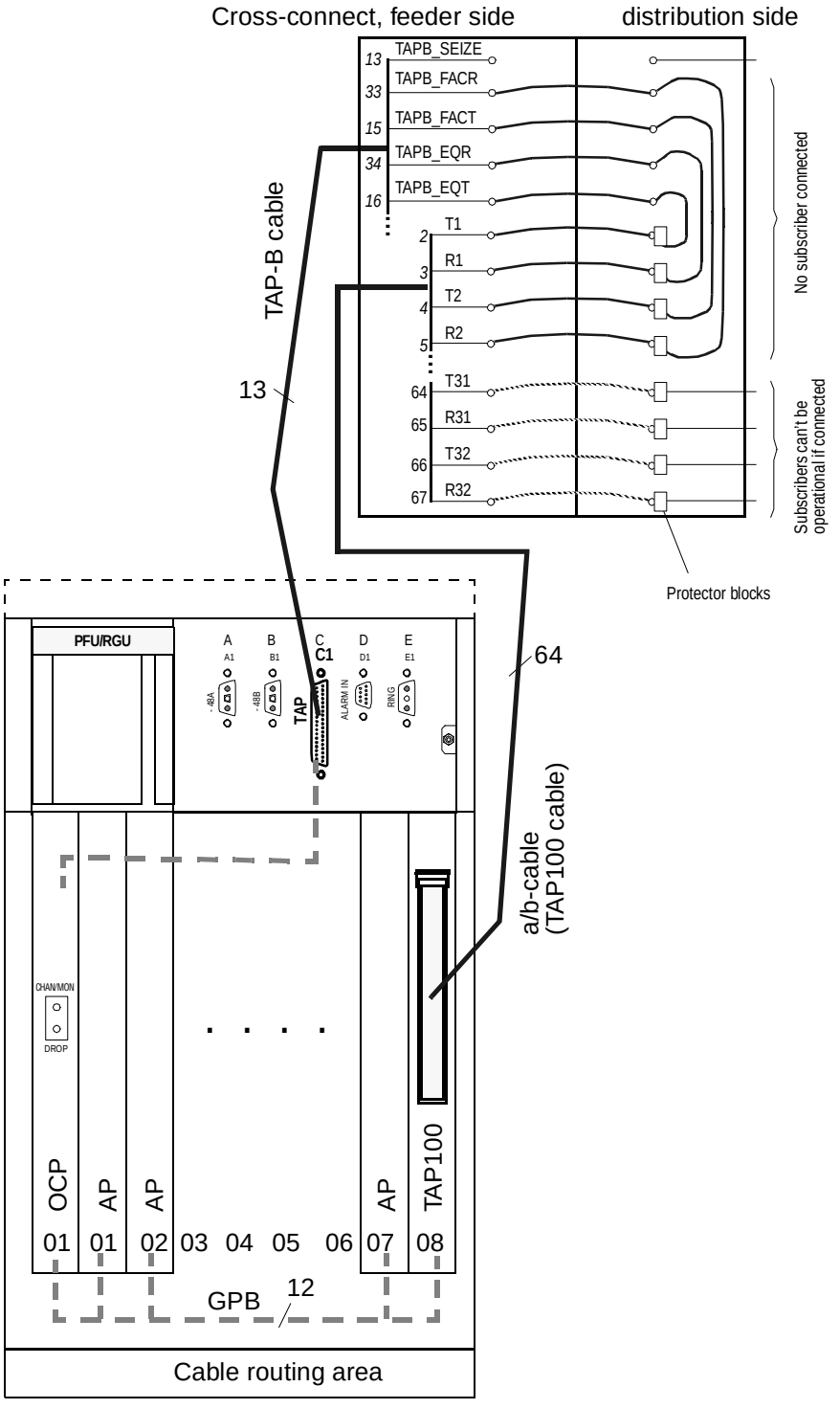


Figure 6-11 Cabling for integrated testing with TAP100 inserted in slot position AP-8 for an outside cross-connect

TAP100-specific cabling on the MDF

The following 4 connections have to be made via the MDF if a TAP100 is used in the ONU Subshelf slot position AP-8:

Table 6-4 TAP-B cable ED 7C818-36 Gr.1x: ONU Subshelf, C1 to MDF (example for TAP100 using AP8)

TAP-B Cable ED7C818-36 Gr1x from ONU Sub-shelf connection panel to the MDF				**a/b-cable ED7C818-30 Gr1x from the TAP100 to the MDF**			
Female conn. C1 (from male C1 on ONU)	***AnyMedia* signal for TAP-B**	**Wire**[a]	**MDF, TAP-B side** (example)	**MDF, TAP100 side** (example)	**Wire**	**Female TAP100 connector** (from male AP8 connector)	***AnyMedia* signal for TAP100**
1...12	not used	-	not used	not used		connected, but not used	-
13	TAPB_SEIZE[b] (multiple testing)	BL-W	257b				not used
14	TAPB_EQ_R1	O-W	258b				-
15	**TAPB_EQ_R[c] (Ring, b-wire)**	**G-W**	**259b**	**224b**	**BL-W**	**3**	**TAP_EQ_R Equipment, (b-wire, port1)**
16	**TAPB_FAC_R[d] (Ring, b-wire)**	**BR-W**	**260b**	**225b**	**O-W**	**5**	**TAP_FAC_R Facility, (b-wire, port2)**
17	TAPB_FAC_R1	S-W	261b			connected, but not used	-
18	TAPB_FAC_M	BL-R	262b				-
19	TAPB_EQ_M	O-R	263b				-
20...30	not used	-	not used				-
31	NC	W-BL	257a				-
32	TAPB_EQ_T1	W-O	258a				-
33	**TAPB_EQ_T[c] (Tip, a-wire)**	**W-G**	**259a**	**224a**	**W-BL**	**2**	**TAP_EQ_T Equipment, (a-wire, port1)**
34	**TAPB_FAC_T[d] (Tip, a-wire)**	**W-BR**	**260a**	**225a**	**W-O**	**4**	**TAP_FAC_T Facility, (a-wire, port2)**
35	TAPB_FAC_T1	W-S	261a			connected, but not used	-
36	TAPB_FAC_E	R-BL	262a				-
37	TAPB_EQ_E	R-O	263a				-

a Cable colors valid for the ED7C818-36 Gr1, ...1A, ...1B, ...1C cable.

b For future use if the TAP100 is used for multiple NE testing (seizing multi-TAPs) or for multiple testing with the remote test unit (via wired OR), currently not used.

c Used for crossconnecting to the test application path for Equipment (corresponds to R1/T1 of TAP100 (1st Z port)).

d Used for cross-connecting to the test application path for Facility (corresponds to R2/T2 of TAP100 (2nd Z port)); required for ISDN testing for example.

6.5.10 Rerouting for the ADSL cables

If ADSL APs are used, the engineering work order or the network provider must specify which POTS subscriber have to be served by ADSL service. These subscriber lines must be disconnected from the subscriber side of the MDF and must be routed to the Z port "input" terminals for the ADSL AP on the switch side of the MDF. The ADSL "output" terminals must be routed to the terminals on the subscriber side where the original POTS subscriber line was connected. For the pinning of the ADSL AP connector see Figure 4-21, page 4-29.

Connecting POTS to the ADSL AP

The following figure shows how the subscriber lines carrying POTS-only services must be rerouted to make subscriber lines carrying POTS and data services (ADSL).

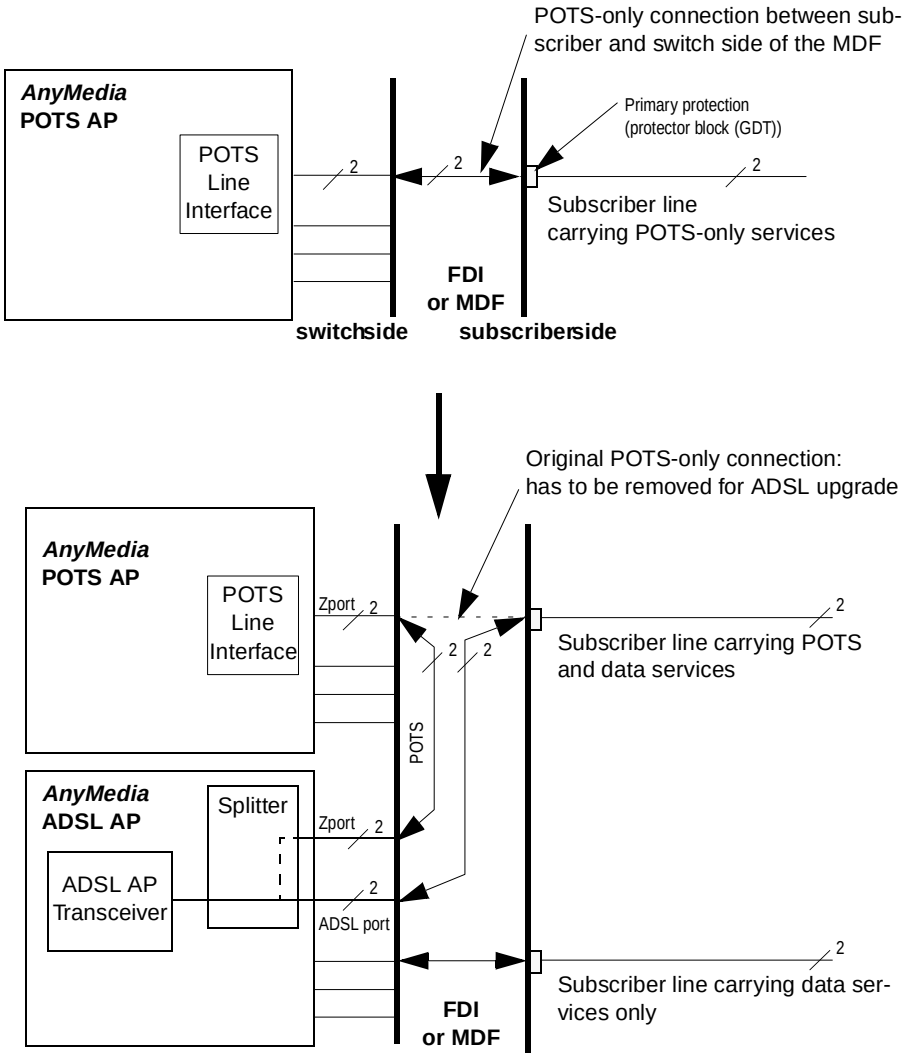


Figure 6-12 Principle for rerouting POTS over ADSL

6.5.11 Installing the AC mains cable

Overview

This procedure consists of preparing the delivered AC mains cord and connecting it from the ONU shelf to the customer's external mains source of nominal 120/240 V AC.

The ONU is delivered with an AC mains cord of about 3 m which is already inserted in the ONU housing. The cable is rolled up and attached on the outer right side of the ONU housing. The cable is equipped with the IEC 60320 plug on the ONU side and has open ends on the customer side. The AC power cord 848506820 for the IEC 60320 inlet must be used.

NOTE:
For the first deliveries the rectifier is equipped with an IEC 320 AC inlet. These rectifiers require the appropriate power cord 848471181 for the IEC 320 inlet.

Precautions

The connection on the customer's side should be permanent.

The PE/green wire of the customer's AC source wire must have a proper connection to the central approved earthing point according to local regulations.

The customer's mains must be fuse protected. Inside the ONU there are no field replaceable fuses for the AC mains. For ease of maintenance a circuit breaker or a main breaker is recommended.

The following fuse/circuit breaker values are allowed.

Table 6-5 Fusing values for AC mains

Nominal AC Voltage	Fuse Value for cross-section >1 mm^2	Conventional Tripping Current
120 V AC	13 A to 16 A	≤ 1.4 x nominal fusing value
220/240 V AC	10 A to 16 A	

For connecting bear in mind the local regulations.

NOTE:
The 540 W power rectifier unit for the indoor ONU is situated for operating in over voltage category 2 (according to IEC 60664-1) locations only.Mains transients may never cross 2.5 kV. Additional surge arrestors may be required depending on the site conditions.

Connecting to AC mains

The AC cables should be connected in the following order.

Step	Procedure
1.	Verify that the customer's mains is switched to "OFF" and secure against cutting or connecting in the mains again. Mark the OFF-state if required.
2.	Measure the voltage on the customer's mains and verify that it is de-energized. If required short the deactivated mains to earth. Follow local regulations.
3.	Verify that the fuse/circuit breaker meets the terms of Table 6-5, page 6-26.
4.	If the ONU shelf is already equipped with the rectifier verify that the AC connector is not inserted in the AC inlet of the rectifier. Otherwise disconnect.
5.	Be sure that the grounding connections have been checked. If not refer to Chapter 6.5.2, page 6-11 and check.
6.	Route the AC mains cable from the ONU to the customer's mains. Do not connect. Use the appropriate power cord type for the IEC 60320 or IEC 320 AC inlet according to the rectifier used.
7.	Strip the AC mains cable to a length of 30 mm. Strip each of the three wires to a length of 10 mm.
8.	If using a cable with flexible or stranded wire then press multicore cable ends onto each stripped end of the cable wire.
9.	Route the cable to the AC source terminals and attach the cable with cable ties as needed.

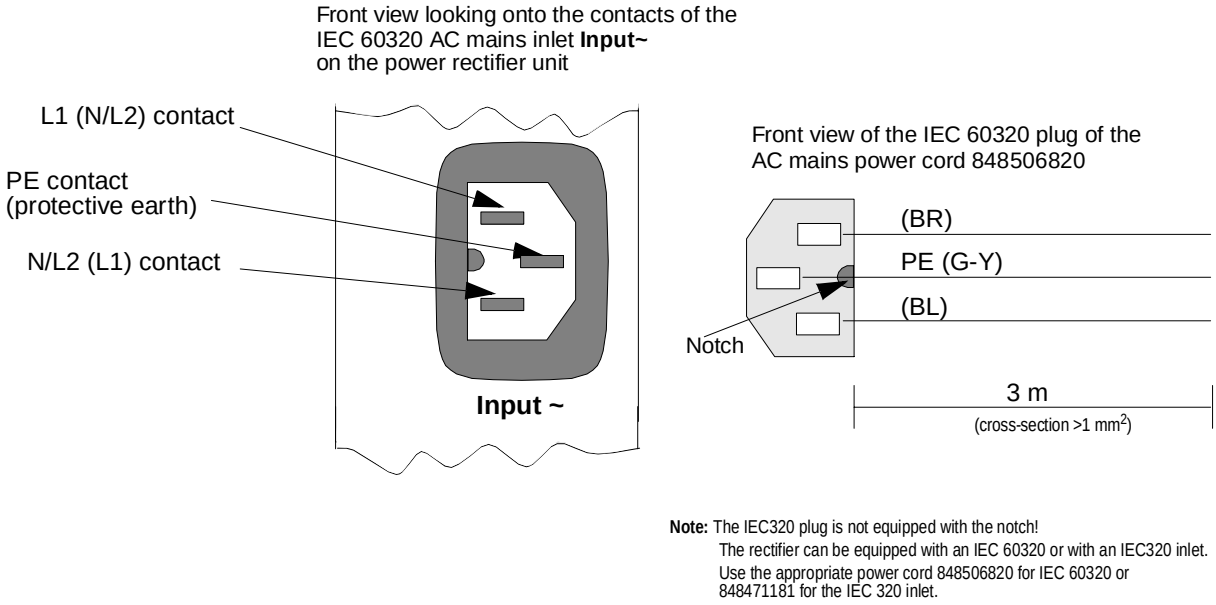

Front view looking onto the contacts of the
IEC 60320 AC mains inlet **Input~**
on the power rectifier unit
L1 (N/L2) contact
PE contact
(protective earth)
N/L2 (L1) contact
Input ~
Front view of the IEC 60320 plug of the
AC mains power cord 848506820
(BR)
PE (G-Y)
(BL)
Notch
3 m
(cross-section >1 mm2)
Note: The IEC320 plug is not equipped with the notch!
The rectifier can be equipped with an IEC 60320 or with an IEC320 inlet.
Use the appropriate power cord 848506820 for IEC 60320 or
848471181 for the IEC 320 inlet.

Figure 6-13 IEC 60320 mains connector and power cord

10. Insert the PE wire into the PE terminal and screw tight or connect/fix.

11. Insert the brown and the blue wire into the correct terminals for L1 and L2/N and screw tight or connect/fix. For connecting follow local regulations.

12. Check that the wires are fixed.

13. Remove the short of the deactivated mains if done in Step 2. Follow local regulations.

14. If the installation continues soon the AC mains can be switched "ON". Bear in mind that the AC cord is energized.

6.5.12 Installing serial cable for the PC GSI

The serial cable is required for connecting the GSI PC to the OCP, connector RMC (only if required).

No serial cable is delivered. A standard serial female/male 9-pin cable with 1:1 connections can be used. For the cable pinning see Table 4-6, page 4-22.

Insert the serial cable, route it in the upper cabling area to the OCP. Connect to the RMC connector.

6.5.13 Finishing the cabling

6.5.13.1 Mounting the cable access cover

The ONU housing is equipped with a cable access cover mounted on the right side of the ONU. This cover was removed at the beginning of installation and must now be reinstalled.

Step	Procedure
1.	Sort all external cables routing on the right side of the ONU housing and arrange two a/b-cable groups. Take care that the fiber is not stressed or bent, see figure below.
2.	Fix the two groups horizontally. Add cable ties as needed.
3.	On the back of the right side route the cables at 90 degrees upward or downward as required and fix them to the wall. Bear in mind the cable access cover dimensions and also the cable outlet dimensions of the cover.
4.	Fix the fiber with the protective spiral wrap to one of the a/b-cable groups separately so that the fiber is not stressed mechanically, see the figure below.

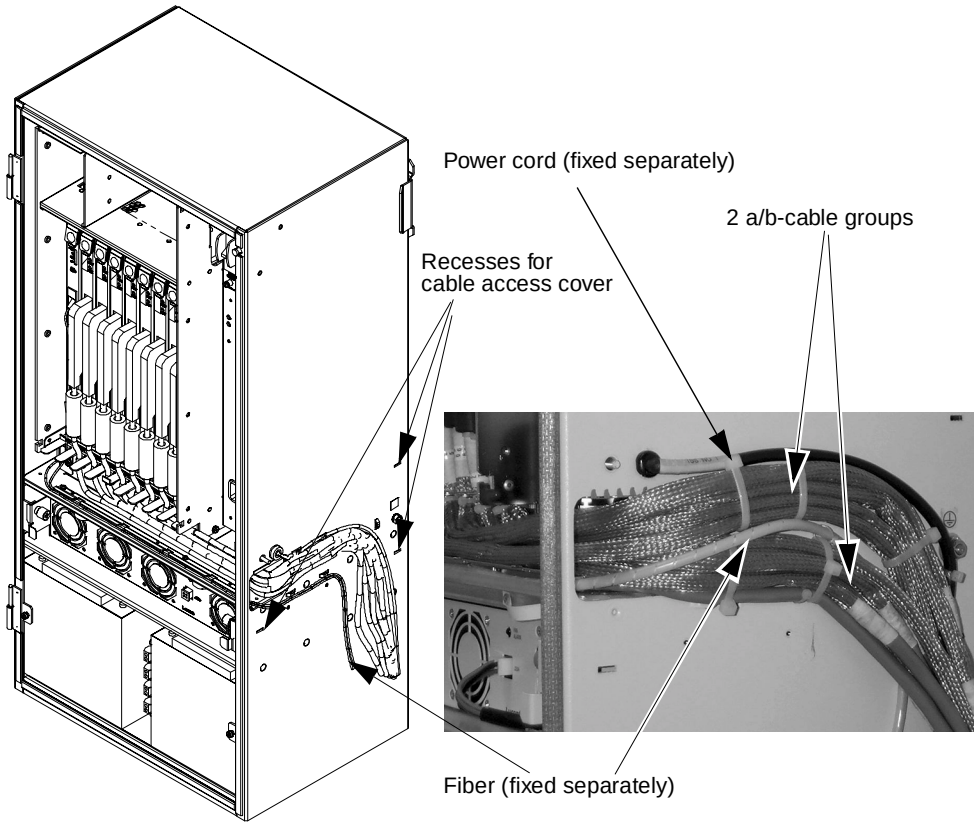


Figure 6-14 Cable routing outside of the ONU

5. Locate the cable access cover and insert the fixing noses of the cable access cover into the 3 recesses (two at the back, one at the front). Push to the left so that the noses slide in completely

6. Move the cable access cover about 0.5 cm to the back so that it becomes fixed by the noses.

7. Thread and tighten the fixing screw on the right side inside the ONU housing.

8. If the door has been hung out locate the door and hang in the door starting with the upper hinge.

9. Close the door.

6.5.14 Special handling of the AC mains cable valid only for the first service application (FSA in 1999)

For the FSA in 1999 the AC mains cord must be equipped with a ferrite toroidal core (choke) as shown in the figure below. Two complete turns are required at least.

NOTE:
This choke may not be used anymore!

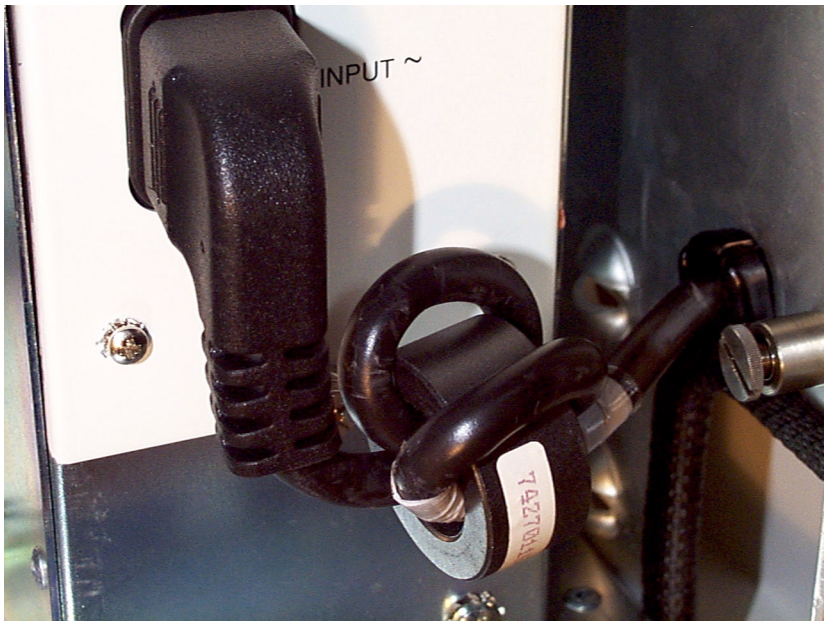


Figure 6-15 AC mains cable for FSA deliveries

NOTE:
The AC mains cable and the strain relief clamp of the ONU housing must be removed temporarily. If required the cable and the strain relief clamp must be replaced.

Mounting and installation of batteries

7

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Mounting and installation of batteries

7

7.1 Overview of mounting batteries

This section gives the steps for unpacking, inspecting and mounting the batteries into the *AnyMedia*® Optical Network Unit (ONU).

The following information and instructions are contained in this section:

- General battery information such as:
  - — general safety information for batteries, see Chapter 7.2.1, page 7-3
  - — required tools for installation and maintenance, see Chapter 7.2.2, page 7-5
  - — battery delivery, see Chapter 7.2.3, page 7-5
  - — required warranty and storage conditions for IR-30EC batteries, see Chapter 7.3.1, page 7-6 and Chapter 7.3.2, page 7-7.

NOTE:
An experienced installer familiar with the battery installation and the storage/charging and warranty considerations can jump to Chapter 7.3.3, page 7-10 and start with unpacking the batteries. Be sure to know and to observe the safety precautions and the warranty conditions. Always fill out the Installation and Maintenance Record.

- Checking the required charging date for IR-30EC batteries, see Chapter 7.3.2, page 7-7
- Handling and uncrating the batteries, see Chapter 7.3.3, page 7-10
- Inspecting and physically verifying the condition of the batteries, see Chapter 7.3.4, page 7-11

- Mechanical installation of the batteries in the battery compartment of the ONU, see Chapter 7.3.5, page 7-13.

Arcing batteries and short circuit

DANGER:

Arcing of batteries, destruction of batteries and risk of fire in the event of a short circuit.

A short circuit of the batteries will cause arcing on batteries.
A short circuit in the batteries will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete system.
Arcing can cause burns to the hands and damage to the eyes.
Never short out the battery's terminals.
Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Always use properly insulated tools and test equipment.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

The connecting of the batteries to the power rectifier unit (PRU) and the low voltage disconnect unit (LVD) is described in Chapter 8.2, page 8-2.

7.2 General battery information

The default configuration of the *AnyMedia* Optical Network Unit (ONU) for wall-mounted indoor applications with the Orderable Item No. ED7C841-01 is delivered without batteries. The housing is designed for mounting 4 batteries of type IR-30EC from Tyco.

The four batteries are delivered separately; for ordering, see Chapter 3.4, page 3-8. Each battery is packed in a single cardboard box. At least 4 batteries are packed in one wooden box. All the other accessories are packed in one plastic bag which is also packed in the wooden box.

The batteries are provided with a 14 AWG lead assembly with a keyed 2-pin connector. The battery cable routing to the rectifier/LVD inside the ONU housing is equipped with 4 matching connectors. Therefore for standard installation and connection of the batteries no special tools are required.

The insulated tools as stated in Chapter 5.2.1, page 5-3 are required for maintenance, repair or for mounting different batteries.

7.2.1 Safety

Battery handling

For safe battery handling always observe the following basic precautions:

- Use only properly insulated tools and test equipment.
- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses, acid-resistant gloves, rubber overshoes and apron.
- Test circuits before touching.
- Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn-on.
- Be aware of potential hazards before servicing equipment.
- Do not short the battery.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring).
- Take care when removing or replacing any covers or brackets; avoid contacting any terminals.
- Always verify the polarity before connecting cables to the batteries.
- For cleaning batteries use a damp soft cloth only. Do not use solvents, paraffin, abrasive or proprietary cleaning fluids.

While unpacking and/or installing the batteries, you must:

- Never place metal objects (including tools) on top of a battery.
- Never short out the battery's terminals.
- Never use an open flame near batteries.
- Never stack batteries (in or out of their shipping cardboard boxes).
- Never transport or move batteries so that their weight is supported by the terminal connections.
- Never charge batteries which are visibly damaged or frozen (typically at temperatures below -40°C if the battery is fully charged).

Precautions

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations. An explosion could occur when sparks are created near the battery string. Do not place batteries in a sealed enclosure. Especially freshly charged batteries may produce explosive gases for about 24 hours after charging.

An explosion could occur when sparks are created near the battery string. Check that the batteries are not charging or discharging before loosening or removing battery connections as sparks may occur. As always, adequate ventilation must be provided. Such an explosion could short circuit other battery modules and result in a fire.

The GMT-type fuse in the LVD can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only fuses provided with safety caps for this type of circuit.

Near the batteries there shall be a distance of 0.5 m (cord measurement) from any spark gaps, flames or glowing plants (EN 50272-2).

NOTE:
Any mechanical power switches and also static electricity are sources of spark gaps!

Exercise extreme care to avoid any short circuit across the battery terminals. Even a single battery poses a potentially high energy hazard if shorted. Shorting a battery may result in explosion of the battery, injury to the installer and damage to equipment. A tool or other metallic object causing the short may be thrown or vaporized due to the battery energy.

Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken. Review the safety precautions.

Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections.

If the battery is to be installed on an electrically conductive surface, a non-conductive mat or surface should be placed between the battery and the conductive surface.

In the event of electrolyte contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water. In the event of electrolyte in the eye, pour water into the inner corner of the eye and allow at least one liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

If large acid spillage occurs, use agricultural or industrial lime instead of soda for neutralization before cleanup. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after cleanup.

See also the warnings in Chapter 1.11, page 1-18.

7.2.2 Required tools

Tools

You will need the following tools and materials to install and test the battery string:

- Splash-proof safety goggles, acid-resistant gloves, rubber overshoes and apron
- Cleaning cloth
- Lime and/or soda (sodium bicarbonate or sal soda)
- Insulated socket drive or nut driver set (1/4-inch through 3/4-inch sockets) and torque wrench (0 to 60 in-lbs, 6 Nm) for maintenance/replacement
- Sandpaper or abrasive cloth (for cleaning the battery compartment only!)
- DMM (Digital Multimeter), for example, Tek DM254 or *Fluke*[1] 8060A or equivalent. (The accuracy of an equivalent meter should be 0.05 percent on the DC scale)
- Current converter or current probe 1:10 for multimeter used for up to 20 A
- Thermometers for measuring the ambient temperature and the battery temperature (contact type)
- Waterproof fine line marker for marking batteries and the connectors, also required to write the installation date onto the batteries.

For safety a Class C fire extinguisher should be reachable.

7.2.3 Battery delivery

Battery set

The batteries will be delivered as a set separately packed in a wooden box with the following components:

Table 7-1 Delivered batteries

Qty.	Comcode	Type	Consisting of:
4	407928761	IR-30EC	12-volt, valve-regulated, lead-acid IR Series I battery, with 14 AWG lead assembly terminating with preconnected 2-pin plug
1	107078859	157-622-020	Product Manual IR Series Batteries (Issue 7 or later)
8			Screws (2 per battery, thread 10-32 x 0.50)[a]
1			Battery type label[b]

a Already assembled for the 14 AWG lead assembly. **Note:** These screws are not M5 screws.

b Sticker already attached to the battery. Used for marking the installation date, see Figure 7-4.

1 *Fluke* is a registered trademark of Fluke Corporation.

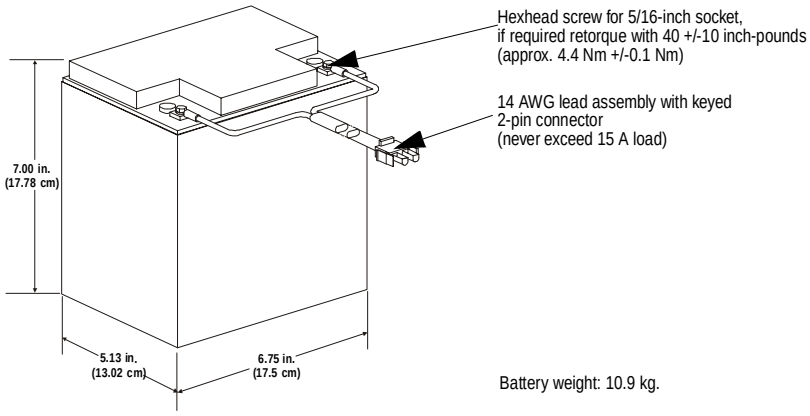

Figure 7-1 IR-30EC battery

7.3 Mounting and connecting batteries

The following information describes how to install the Tyco IR-30EC battery string. It also provides test procedures for verifying the integrity of the installation.

NOTE:
Batteries should be installed after all cables have been installed.

The regulations for storage, handling, external charging and maintenance are different for each battery manufacturer. For IR-30EC batteries follow the regulations given in the Product Manual for IR Series Batteries.

7.3.1 Handling

Always read and understand the Product Manual IR Series Batteries for IR-30EC batteries.

Warranty and installation and maintenance record

The Product Manual for IR Series Batteries includes Installation and Maintenance Records which should be reproduced and used as the installation and maintenance record.

In the installation and maintenance record the installer must record different measurable parameters during installation. Also for maintenance these parameters must be recorded at quarterly intervals by the maintenance person. The completed forms will be used for any future warranty claims.

NOTE:
Chapter 11.5, page 11-18 contains copies of the original Installation and Maintenance Record which can be used for the installation.

Handling considerations

When transporting crates or storing in a warehouse, do not stack more than two shipping containers high.

Always store the shipping container in the upright position as marked on the container.

Provide adequate ventilation during storage.

When removing containers from the shipping van, place them on a dolly truck in their horizontal shipping positions. Verify that the containers have not been damaged. It is important that all containers be handled with care and precautions be taken not to drop the units.

The weight of the packed batteries in their shipping container is about 60 kg for 4 batteries of type IR-30EC.

NOTE:
Using silicone grease or other grease is not required and therefore not allowed for IR-30EC batteries as this can interfere with the battery housing and other electronic components.

7.3.2 Storage considerations for IR-30EC batteries

Shipping state

The IR-30EC batteries are shipped in a charged state. The open circuit voltage for a fully charged battery is:
12.84 to 12.96 V.

Storage considerations and open circuit time

Batteries may suffer irreversible capacity loss during long open circuit stand. The maximum that a fully charged battery may remain on open circuit is 6 months at a temperature of 25°C or 3 months at temperatures exceeding 32°C respectively for IR-30EC batteries.

On the cardboard box of each IR-30EC battery there is a "charge no later than" date stamped which is the date the battery has been on open circuit for 6 months at temperatures of 25°C at maximum; see Figure 7-2 below.

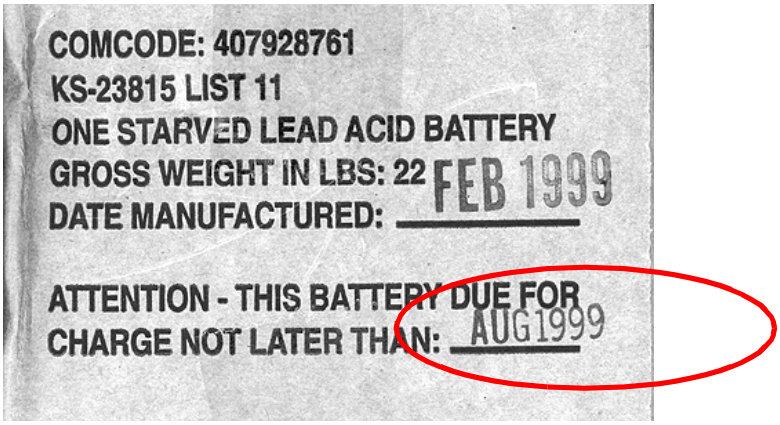
COMCODE: 407928761
KS-23815 LIST 11
ONE STARVED LEAD ACID BATTERY
GROSS WEIGHT IN LBS: 22
DATE MANUFACTURED: FEB 1999
ATTENTION - THIS BATTERY DUE FOR
CHARGE NOT LATER THAN: AUG1999

Figure 7-2 Cardboard box with "charge no later than" date

If external charging is required

If the batteries cannot be installed within this time period the batteries must be charged externally. Consider the procedures stated in the chapter "Initial Charging" in the Product Manual for IR Series Batteries. A copy of these instructions is included in Figure 7-3, page 7-9.

External initial charging

The purpose of an initial charge is to compensate for self discharge that has occurred in the interval between manufacture and installation. Under normal circumstances, the battery will regain most of its capacity after several hours on float charge; 90% capacity should be obtained within 24 hours of float charge. See Figure 7-3, page 7-9 for the detailed initial charging instructions.

NOTE:
All batteries should have similar storage histories. If batteries are older than the allowed open circuit time and have not been maintained in this period the batteries may not be installed and must be replaced.

Table 6-A: Initial Charging

Battery Condition	Action
All batteries have similar date codes and storage histories and none are more than 6* months old or they have been maintained according to the "Battery Storage" section of this product manual.	Make voltage and polarity checks and connect string(s) to plant. Charge at the float voltage of 13.5 ±0.06 volts per battery.
The batteries have dissimilar date codes (more than one month apart) and they are within the required recharge period (charge-by date).	Using an external charger**, charge the string at 13.98 ±0.06 volts per 12V battery for 24 hours. Continue the charge for another 24 hours at the plant float voltage: 13.5 ±0.06 volts. Make voltage and polarity checks and connect the string(s) to the plant.
The batteries are older than 6* months or have not been maintained according to the "Battery Storage" section of this product manual.	Do not install. Replace batteries.
*If the storage temperature exceeds 90 F (32°C), the open circuit time should not exceed 3 months. ** The charger must have overcurrent protection in its output, must be able to remain across the batteries in case of an ac power failure, and should not have crowbar protection. (Crowbar protection is an option used on some commercial portable power supplies that clamps a short across the output leads of the rectifier when the rectifier senses a higher voltage at the load than it is generating. This feature should not be used with batteries.)	

COPY of the Tyco Product Manual IR-30EC and IR-40EC Batteries (Issue 7, Comcode 107078859)

Figure 7-3 Copy of the initial charging recommendation of IR-30EC battery

7.3.3 Unpacking and completeness check

Completeness check

For unpacking and a first completeness check proceed as follows:

Step	Procedure
1.	Move the pallet with the wooden box containing the batteries and the battery accessories (Manual, Silica Gel desiccant) next to the ONU.

NOTE:
Use appropriate material handling equipment to ensure personnel safety and equipment protection while moving the battery pallet. Bear in mind the weight of about 10 kg for an IR-30EC battery.

2. Using slip joint pliers remove the staples from the wooden box.

NOTE:
Remove all the staples/nails from the wooden box and dispose of them properly.

3. Inside the wooden box locate the loose parts delivered with the batteries. You must find the following:

   — Product Manual IR Series Batteries (Issue 7 or later, Comcode 107078859).

NOTE:
If there are any problems with the equipment or equipment is missing, refer to the job specification or equipment order for the name and telephone number of the local manager to contact and to rectify the problem.

4. Locate the Installation and Maintenance Record in the Product Manual IR Series Batteries and reproduce or use the copies in Chapter 11.5, page 11-18.

7.3.4 Battery inspection

Battery inspection

For battery inspection and preparation of the installation proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record where the order number and measurements carried out during installation have to be recorded. The Installation and Maintenance Record is required for warranty validation.
2.	The packing list includes the order number. Record this order number to the Installation and Maintenance Record.
3.	Take out each battery and place each battery on a level surface.
4.	Mark the first battery, the 2-pin connector and the cardboard box with number 1. The number is required for the installation record.
5.	Verify on the cardboard box that the battery has not reached the allowed open circuit time, see Figure 7-2, page 7-8. Follow the instructions stated in the Product Manual IR Series Batteries for *Initial Charging*, see Figure 7-3, page 7-9. Possibly the battery should have been charged externally. The charging regulations of the battery manufacturer must be observed. The procedures required are vendor specific and can vary for different battery types.

NOTE:
If IR-30EC batteries are older than the allowed open circuit time and have not been maintained in this period the batteries may not be installed and must be replaced.

6.	Inspect the battery for shipping damage/obvious damage and for any sign of acid spillage.
7.	Check the battery for fractured housings. Batteries with fractured housings are defective and must not be used. Return damaged batteries to the manufacturer in their original packing.

NOTE:
Return damaged batteries to the manufacturer. Record any indications of acid spillage on the bill of lading before signing it. Acid spillage is a valid criterion for rejection of product. If it is determined that the battery should be returned to the manufacturer, it will be easier to return at this point than if the battery has been completely installed.

8. Note this battery number and the battery serial number which can be found on the battery sticker in the Installation and Maintenance Record, for position of the serial number see figure below.

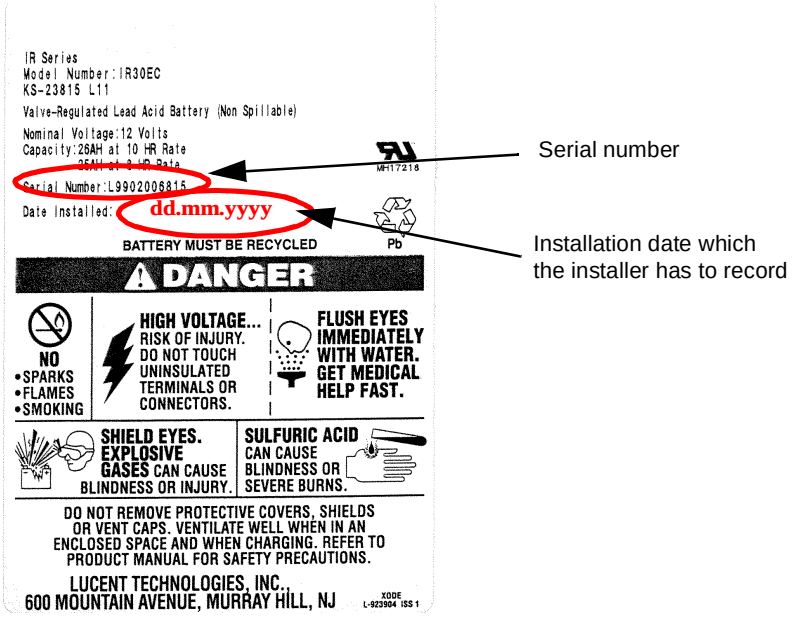
IR Series
Model Number:IR30EC
KS-23815 L11
Valve-Regulated Lead Acid Battery (Non Spillable)
Nominal Voltage:12 Volts
Capacity:26AH at 10 HR Rate
Serial Number:L9902006815
Date Installed:
dd.mm.yyyy
BATTERY MUST BE RECYCLED
Pb
DANGER
NO
•SPARKS
•FLAMES
•SMOKING
HIGH VOLTAGE... RISK OF INJURY. DO NOT TOUCH UNINSULATED TERMINALS OR CONNECTORS.
FLUSH EYES IMMEDIATELY WITH WATER. GET MEDICAL HELP FAST.
SHIELD EYES. EXPLOSIVE GASES CAN CAUSE BLINDNESS OR INJURY.
SULFURIC ACID CAN CAUSE BLINDNESS OR SEVERE BURNS.
DO NOT REMOVE PROTECTIVE COVERS, SHIELDS OR VENT CAPS. VENTILATE WELL WHEN IN AN ENCLOSED SPACE AND WHEN CHARGING. REFER TO PRODUCT MANUAL FOR SAFETY PRECAUTIONS.
LUCENT TECHNOLOGIES, INC.,
600 MOUNTAIN AVENUE, MURRAY HILL, NJ
Serial number
Installation date which the installer has to record

Figure 7-4 Battery label with positions of battery serial number and installation date

9. Measure the open circuit voltage of battery 1 and record in the Installation and Maintenance Record.

   Comment: In a running system the IR-30EC battery may be discharged to 10.5 V at minimum.

NOTE:
If the battery voltage has reached 12.84 V the complete battery string just installed must be charged by the internal power rectifier unit immediately after mechanical installation, see Chapter 8.5, *Connecting and charging batteries* on page 8-10. Otherwise the batteries must be charged externally.

10. Note the installation date on the sticker of each battery and also in the field *Date Installed* in the Installation and Maintenance Record.

11. Repeat Steps 4 to 10 for the other 3 batteries, mark/note with numbers 2 to 4.

7.3.5 Battery arrangement

Battery compartment

The next figure shows the battery arrangement for the 4 IR-30EC batteries. The battery compartment is located in the lower part of the ONU housing.

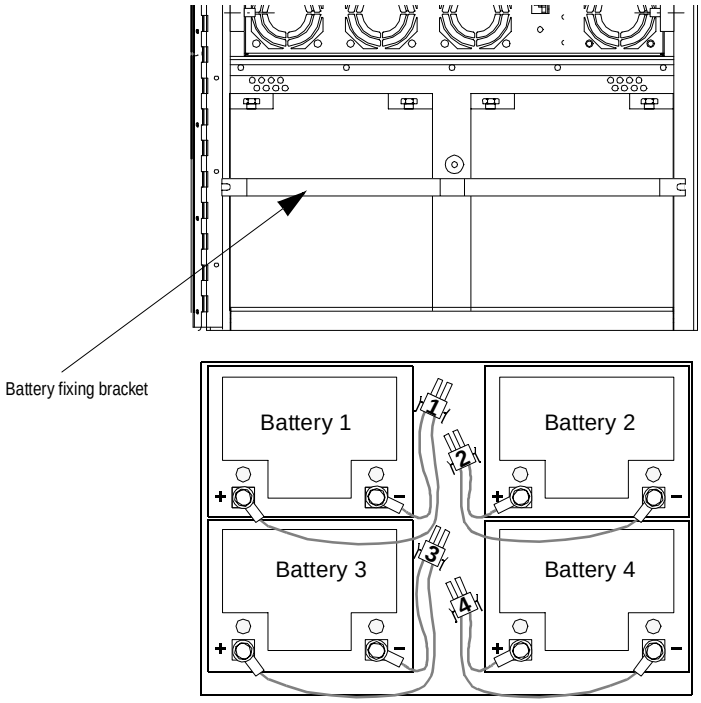

Figure 7-5 Battery arrangement (top view)

7.3.6 Mounting batteries

Installation

The 4 IR-30EC batteries have to be inserted in the ONU housing and have to be connected to the factory installed battery cable with the four 2-pin connectors. For thermal adjustment of the charging voltage a thermal probe has to be inserted between the metallic battery case and the battery on the right side of battery 3.

Arcing batteries and short circuit

DANGER:

Arcing of batteries, destruction of batteries and risk of fire in the event of a short circuit.

A short circuit of the batteries will cause arcing on batteries.
A short circuit in the batteries will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete system.
Arcing can cause burns to the hands and damage to the eyes.
Never short out the battery's terminals.
Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Always use properly insulated tools and test equipment.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Place the batteries in the battery compartment and secure them as follows:

Step	Procedure
1.	If the LVD is equipped ensure that the battery circuit breaker is switched "OFF"; for location of the LVD and the other parts see Figure 2-6, page 2-20.
2.	If the power rectifier unit is equipped ensure that the AC mains cord is not connected.
3.	Remove the locking screws for the battery fixing bracket and remove the bracket.
4.	Locate the battery cable and the thermal probe cable (shipped with rack) and move them out of the way.
5.	Position the first battery (No. 1) with its terminals facing to front in the rear left corner of the battery compartment as shown in Figure 7-5, page 7-13. Move the 2-pin battery assembly to the right.
6.	Repeat with the second battery (No. 2) and position it in the rear right corner of the ONU. Move the 2-pin battery assembly to the left.
7.	Repeat with batteries No. 3 and No. 4 as shown in Figure 7-5.

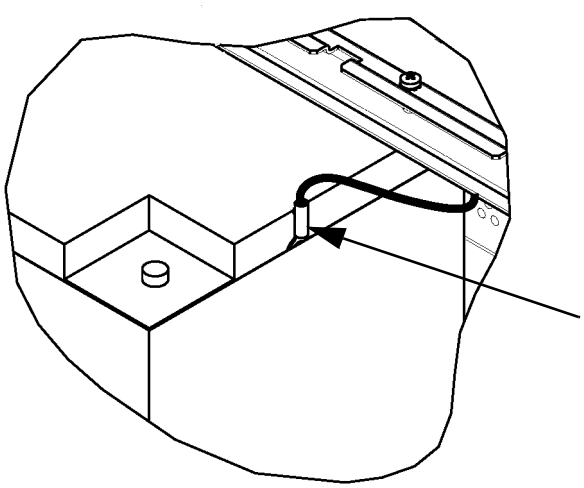

Figure 7-6 Position of the thermal probe

8. Move the batteries 1 and 3 and also batteries 2 and 4 close together and move them to the side walls of the housing.

9. Verify that the connector J3 on the rectifier side is not connected. For location of the LVD and the other parts see Figure 2-6, page 2-20.

10. Connect the keyed 2-pin plugs of the batteries to the appropriate connectors of the battery cable and arrange the battery cabling in the free space between the batteries.

11. Measure the battery string voltage on the outermost pins of the battery cable connector J3 and record in the Installation and Maintenance Record. Verify that the batteries are connected properly and that the polarity is correct.

Short circuit when taking voltage readings

WARNING:

Risk of a short or arcing due to not-fuse protected battery cabling.

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete ONU.
Use insulated probes for measuring.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken.

12. Locate the thermal probe and insert between the metallic case and the battery housing of battery 3 as shown in the figure below.

13. Locate the battery fixing bracket and mount.

System power-up

8

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8.1.1 Principle of power-up sequences 8-1

8.2 Mounting the packs for powering 8-2

8.2.1 Equipping the rectifier shelf for powering 8-2

8.2.2 Equipping the ONU Subshelf for ringing 8-5

8.3 Powering up the AC mains 8-7

8.4 Check the rectifier and batteries 8-8

8.5 Connecting and charging batteries 8-10

Contents

System power-up

8

8.1 General information for the initial power-up

This section contains the procedures for the first power-up of the *AnyMedia*® Optical Network Unit (ONU).

The ONU is well prepared for ease of power-up.

The ONU must be equipped with the power rectifier unit (PRU) and with the low voltage disconnect unit (LVD) in the rectifier shelf. The ringing generator unit (RGU) must be inserted in the ONU Subshelf. After that the AC mains can be powered and the batteries can be charged.

8.1.1 Principle of power-up sequences

The ONU is delivered with all internal cabling for the powering.

This chapter describes the power-up procedures from supplying the ONU with the required packs to the first charging of the IR-30EC batteries.

The procedures below are required:

- Preparing the PRU for charging, see Table 8-2, page 8-3
- Installing the PRU and the LVD into the rectifier shelf, see Chapter 8.2.1, page 8-2
- Installing the RGU into the ONU Subshelf, see Chapter 8.2.2, page 8-5
- Powering up the AC mains, see Chapter 8.3, page 8-7
- Checking the rectifier and battery voltage, see Chapter 8.4, page 8-8
- Connecting and charging the batteries, see Chapter 8.5, page 8-10.

8.2 Mounting the packs for powering

8.2.1 Equipping the rectifier shelf for powering

The rectifier shelf must be equipped with the PRU and with the LVD which are delivered separately; for ordering see Chapter 3.3.1, page 3-4.

NOTE:
The LVD is installed at delivery. Only for the first deliveries the LVD has been delivered separately.

For the positions of the packs which have to be inserted see Figure 8-2, page 8-4.

Proceed as follows:

Step	Procedure
1.	Use the wrist strap, always observe the ESD safety guidelines, see Chapter 1.8, page 1-6.
2.	Move the AC mains cord aside so that the rectifier shelf inside the ONU is freely accessible.
3.	Locate the following packs:

Table 8-1 Packs of the rectifier shelf for powering

Pack designation	Comcode	Apparatus Code
Power rectifier unit 540 W (PRU)	108595844	RS0540, Issue 1:1
Low voltage disconnect unit (LVD)[a]	108784109	LVD500, Issue 2:2

a Can be installed already. Only LVDs with Issue S2:2 or later may be used! Any LVD marked S1:1 for series and vintage should be replaced with the new version marked S2:2 or later.

4. Unpack the PRU and check that the rectifier is equipped with an IEC 60320 AC inlet (Issue 1:), see Figure 6-13, page 6-28.

5. Locate the 3-position switch Margin on the top of the rectifier; for the position of the Margin switch see the figure below.

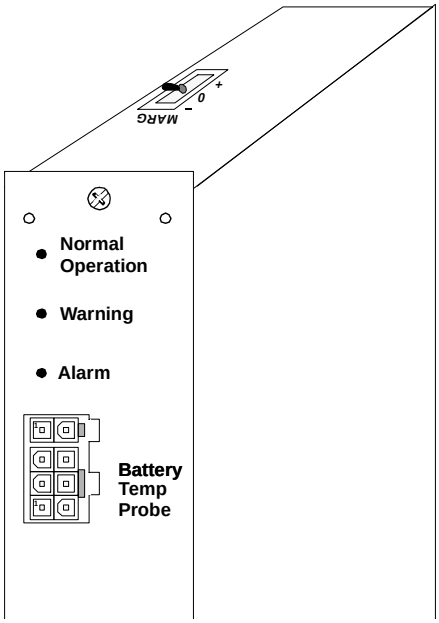


Figure 8-1 Position of the Margin switch

Comment: This 3-position switch adapts the charging voltage for different battery types. The following adjustments are possible.

Table 8-2 Charging adjustments for the PRU via Margin switch

Margin switch position	Charging voltage [V][a]	Recommended battery type
MARG position "+"	-54.9 ±0.2 V	-
MARG position "0"[b]	-54.5 ±0.2 V	-
MARG position "-"	-54.1 ±0.2 V	IR-30EC

a The voltage is valid for 25°C and the thermal probe is connected into the PRU. If the thermal probe is not connected the voltage is fixed in the rectifier to -52.5 V.

b Factory setting as it is delivered.

6. For the IR-30EC batteries used in the standard application adjust the Margin switch to:
"-" position.

Comment: If other batteries are used the engineering work order will specify the required setting.

7. Slide the PRU into the lower position of the rectifier shelf, push back and tighten the two fixing screws on the top and on the bottom of the face-plate. For positions of the packs see the figure below.

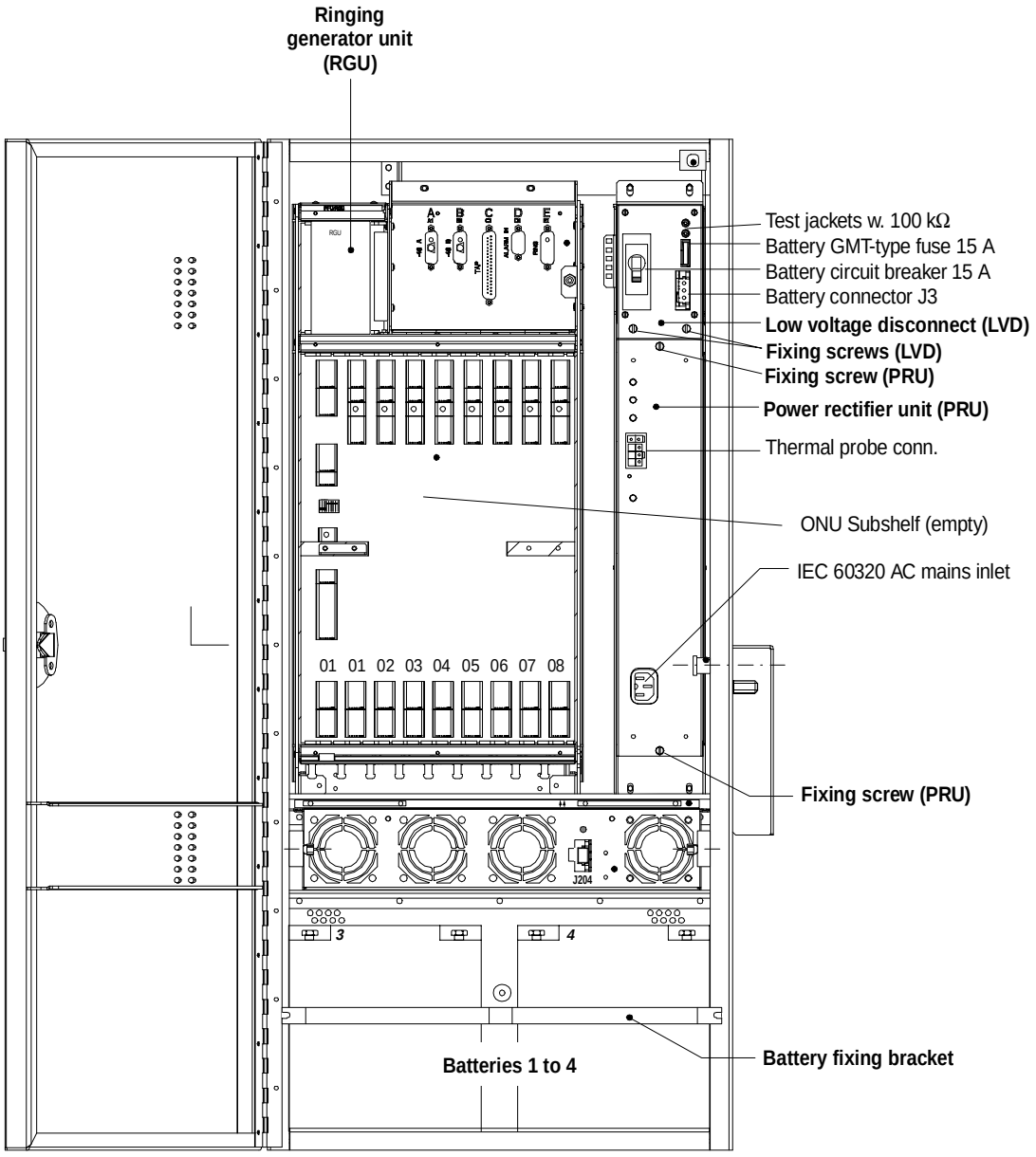


Figure 8-2 ONU with batteries, LVD, PRU, RGU and an empty ONU Subshelf

8. If the LVD is already installed switch the battery circuit breaker to OFF and disconnect the battery cable J3. If the LVD is not installed continue with step 9.

9. Unpack the LVD (108784109) and verify that the battery circuit breaker is switched to OFF. Otherwise switch to OFF.

10. Check that the GMT-type fuse is equipped with the correct value of 15 A. If not locate the spare GMT-type fuses 15 A (Comcode: 408026243) which have been separately packed and were removed during the first inspection and insert the fuse.

11. Slide the LVD into the upper position of the rectifier shelf, push back and tighten the two fixing screws left and right on the bottom of the faceplate. For positions of the packs see the figure above.

12. Do not connect the battery cable to connector J3!

8.2.2 Equipping the ONU Subshelf for ringing

For the standard application the ONU Subshelf must be equipped with the RGU, which is delivered separately; for ordering see Chapter 3.3.1, page 3-4.

NOTE:
The RGU can be adjusted for different ringing frequencies of 17, 20, 25 or 50 Hz via two jumpers. The factory setting is 25 Hz.

Proceed as follows:

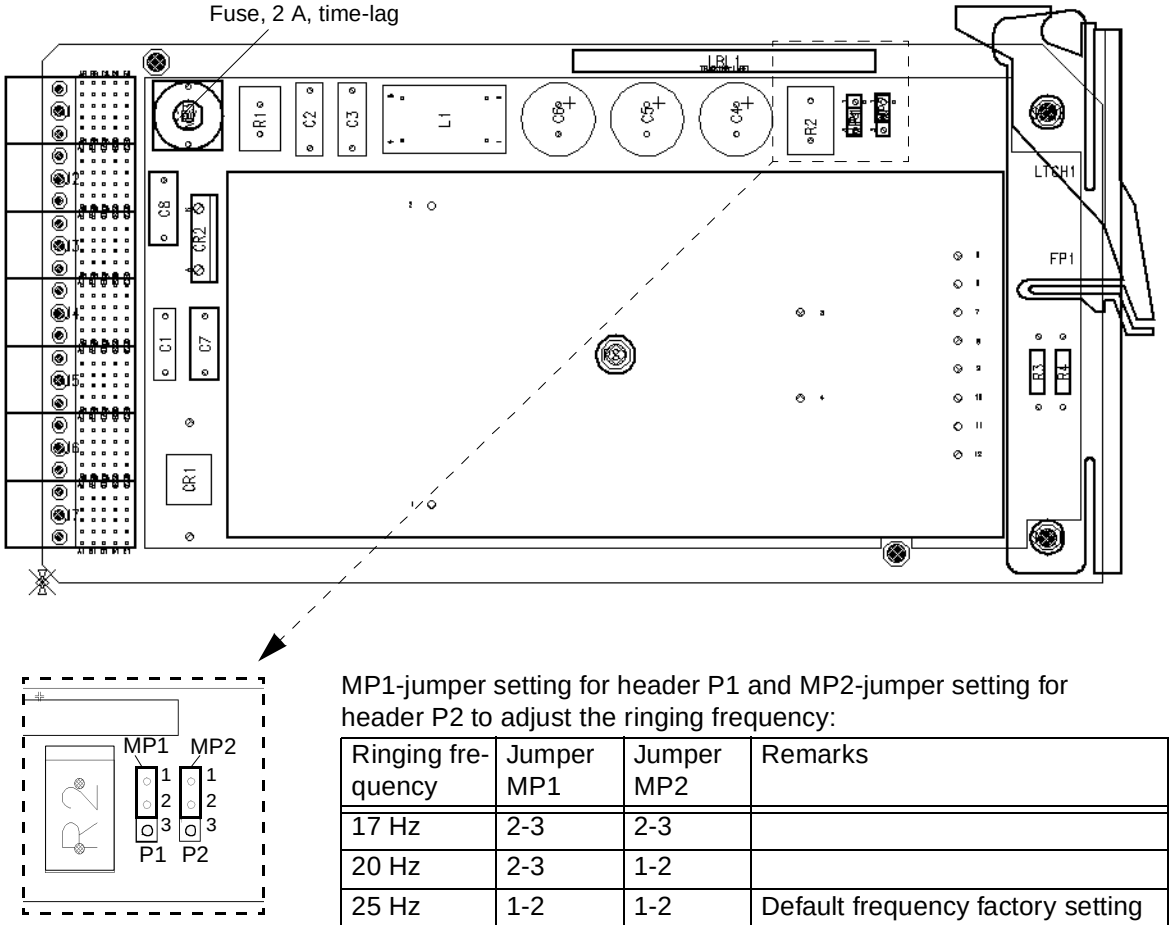
Step	Procedure

1. Locate the following packs:

Table 8-3 Packs of the ONU Subshelf for ringing

Pack designation	Comcode	Apparatus Code
Ringing generator unit (RGU)	108489741	RGU500

2. Unpack the RGU and verify that the jumpers are set to the correct ringing frequency as stated in the engineering work order. For adjusting see figure below.



MP1-jumper setting for header P1 and MP2-jumper setting for header P2 to adjust the ringing frequency:

Ringing frequency	Jumper MP1	Jumper MP2	Remarks
17 Hz	2-3	2-3	
20 Hz	2-3	1-2	
25 Hz	1-2	1-2	Default frequency factory setting
50 Hz	1-2	2-3	

Figure 8-3 Location and settings of the jumpers MP1/MP2 on the RGU

3. Verify that the latch is swung out (OPEN position), otherwise swing the latch upwards about 90 degrees.

4. Slide the RGU into the upper position of the ONU Subshelf with the printed board to the right and push back. Lock the RGU in position by pressing firmly on the rounded indentation on the top latch until it clicks into place. For the position of the RGU see Figure 8-2, page 8-4.

8.3 Powering up the AC mains

The AC mains has been connected to the customer´s mains already, see Chapter 6.5.11, page 6-26, but the AC plug may not be inserted.

NOTE:
The installation must have an independent ground connection to an approved earth electrode for indoor applications. Grounding circuit continuity is vital for safe operation of the *AnyMedia* Optical Network Unit. The minimum size of protective bonding conductor should be ≥6 mm^2 or ≤AWG9. The framework must be correctly connected to the protective earth before the start of work.

For powering up the AC mains proceed as follows:

Step	Procedure

1. Be sure that the ONU housing is correctly connected to an approved earth, otherwise check the earthing continuity, see also Chapter 5.5.5, page 5-24.

2. For the first power-up be sure that no packs are inserted in the ONU Subshelf except the RGU, otherwise it is recommended to remove these packs temporarily.

3. Verify that the battery cable is not connected to connector J3 of the LVD.

4. Locate the AC plug and connect to the IEC 60320 AC mains inlet of the PRU. If the customer´s mains is equipped with a mains breaker/mains circuit breaker/mains fuse switch to ON or insert the fuse respectively.

   Comment: For the first deliveries the rectifier is equipped with an IEC 320 AC inlet. These rectifiers require the appropriate power cord 848471181 for the IEC 320 inlet, see also Figure 6-13, page 6-28.

   Response: The fan unit works, the red LED Fan Alarm may not light and
   on the PRU the Normal Operation LED, the Warning LED, the Alarm LED and the Thermal Shutdown LED have the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Extinguished	Batteries not connected
Warning	Yellow	Lights	Thermal probe not connected
Alarm	Red	Lights	Battery/Probe failure
Thermal Shutdown	Red	Extinguished	Rectifier o.k.

5. Check visually or by listening that all fans in the fan unit work properly, check the air current above the ONU and above the rectifier shelf.

6. Connect the thermal probe cable connector to the connector Battery Temp Probe of the PRU.

   Response: The LEDs have the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Extinguished	Batteries not connected
Warning	Yellow	Extinguished	Thermal probe connected
Alarm	Red	Lights	Battery failure
Thermal Shutdown	Red	Extinguished	Rectifier o.k.

8.4 Check the rectifier and batteries

For the first charging the batteries and the rectifier should be checked for the correct polarity and for the correct charging voltage.

NOTE:
The PRU voltage is temperature compensated with -72 mV/°C in the temperature range from -5°C to +53°C if the delivered thermal probe is used and connected (thermistor 10kΩ ± 0.1%). If the thermal probe is not connected the rectifier voltage is fixed to about -52.5 V (≙ 53°C). The maximum voltage is limited to about -57 ... -58 V. For the compensated PRU voltage see Figure 2-5, page 2-13. The rectifier current is limited to 13 A at maximum, see Figure 2-4, page 2-11.

NOTE:
Due to the two inner protective 100 kΩ resistors of the test terminals inside the LVD the measured voltage will be about 1 V lower than expected. For the Fluke 8060A multimeter the voltage drop will be exactly 1 V at 25°C ambient temperature.

For checking the batteries and the rectifier proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record into where the battery readings, the installation date and the first readings have already been recorded, see Chapter 7.3.4, page 7-11, *Warranty and installation and maintenance record*.
2.	Verify that the battery cable is not connected to connector J3 (Battery Input) of the LVD.
3.	Switch the battery circuit breaker on the LVD to ON.
4.	Measure the rectifier voltage on the test terminals on the faceplate of the LVD, add -1 V (due to the voltage drop caused by the protective resistors) and record in the installation record. *Comment:* Due to the inner voltage drop inside the LVD the voltage measured on the test terminals will be 1 V lower than the voltage which feeds the ONU Subshelf really. You can alternatively measure the rectifier voltage on the terminals of connector J3 on the LVD without voltage drop but you must take care to avoid a short. For the pinning of J3 see Figure 8-4, page 8-10.

Short-circuit when taking voltage readings

WARNING:

Risk of a short or arcing due to battery cabling without fuse protection.

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an destruction by arcing of batteries and cables and thus malfunctioning of the complete ONU.
Use insulated probes for measuring.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery or battery cable connector. Remove test lead connections at the battery or battery cable connector immediately after each reading is taken.

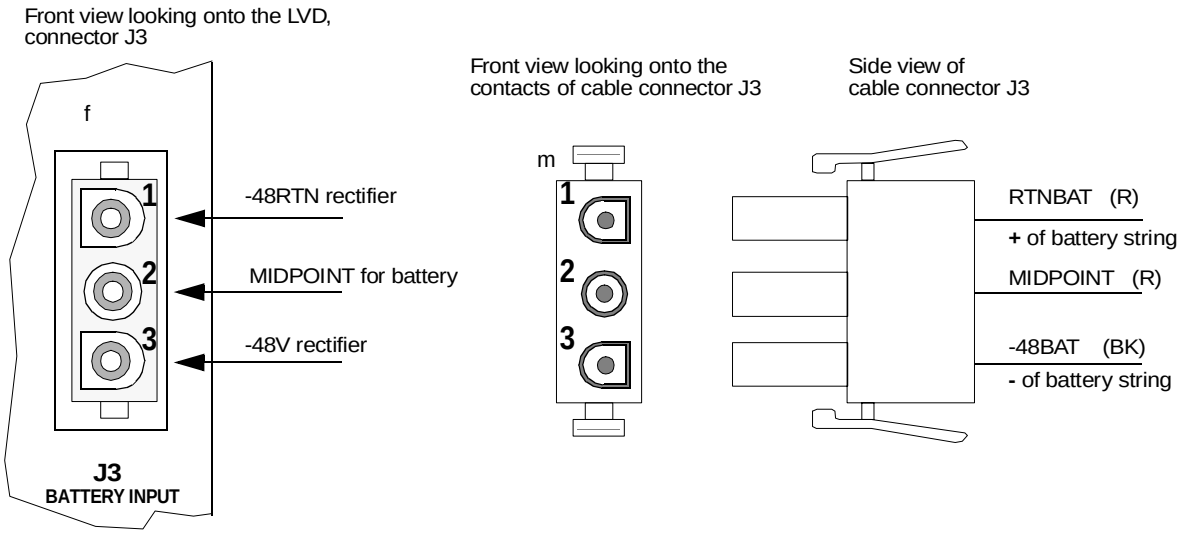


Figure 8-4 Pinning of connector J3 for the LVD and pinning of battery cable connector J3

5. Switch the battery circuit breaker to OFF.

6. Locate the 3-pin battery cable connector J3 and measure the battery string voltage on the outermost connector pins. The outer pin with the black wire is the negative terminal of the battery string. Record the string voltage in the installation record.

   Comment: Between the middle pin (MIDPOINT) and the outer -48BAT pin (black wire) you will measure the string voltage of batteries 4 and 3, between the middle pin (MIDPOINT) and the outer RTNBAT pin (red wire) you will measure the string voltage of batteries 1 and 2.

8.5 Connecting and charging batteries

Before the batteries are connected it is strongly recommended to switch the battery circuit breaker to OFF. If the batteries are connected to a working rectifier the charging current can be about 13 A and cause arcing. When connecting the batteries to a working rectifier the allowed difference between the battery and rectifier voltage must be <0.05 V!

Arcing batteries

WARNING: **Arcing of batteries and risk of fire in the event of a short circuit.**

A short circuit of the batteries will cause arcing on batteries. Arcing can cause burns to the hands and damage to the eyes. Be aware of potential hazards before servicing battery equipment. A metallic object causing a short of the battery terminals may be thrown or vaporized due to the battery energy.
Never short out the battery's terminals.
Always verify the polarity before connecting cables to the battery poles when servicing. The keyed 2-pin cable connector of the IR-30EC battery is protected against confusing poles.

For connecting and for uninterrupted initial charging of the batteries for 48 hours proceed as follows:

Step	Procedure

1. Verify that the battery circuit breaker on the LVD is switched to OFF.
2. Connect the battery cable to connector J3 of the LVD.
3. Switch ON the battery circuit breaker on the LVD.

   Response: The LEDs have the following states:

LED on the PRU	Color	State	Cause
Normal Operation	Green	Lights	Batteries connected
Warning	Yellow	Extinguished	Thermal probe connected
Alarm	Red[a]	Lights or extinguished	Battery balance failure[b]
		Extinguished	Batteries and rectifier o.k.
Thermal Shutdown	Red	Extinguished	Rectifier o.k.

a Flashes at overload.

b If batteries are charged for the first time this failure need not be considered for the first 48 hours.

   Comment: Additionally the PRU is equipped with a supervision part which compares the voltage of batteries 1and 2 (partial string) to the voltage of batteries 3 and 4. The allowed difference is ≤1.7 V. Values >1.7 V will generate a balance failure in the rectifier. If batteries are charged for the first time this failure need not be considered.

4. Record the charging date in the installation record.
5. Charge the batteries for at least 48 hours without interruption.
6. After 48 hours no alarm may be generated on the PRU.

7. After 48 hours switch "OFF" the battery circuit breaker on the LVD and locate the battery cable connector J3 inserted in J3 of the LVD.

8. Disconnect J3 to measure the battery string voltage.

Short-circuit when taking voltage readings

WARNING: **Risk of a short or arcing due to battery cabling without fuse protection.**

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an destruction by arcing of batteries and cables and thus malfunctioning of the complete ONU.
Use insulated probes for measuring.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery or battery cable connector. Remove test lead connections at the battery or battery cable connector immediately after each reading is taken.

9. Measure the string voltage on the outermost pins of the battery cable connector J3 and record in the installation record. For the pinning of J3 see Figure 8-4, page 8-10.

   Response: The voltage measured must be:
   -51.2 V at least.

   Comment: The first charging should not be interrupted and also the batteries should be charged fully without discharging them by a working ONU.

   If the voltage is measured on the test terminals on the faceplate of the LVD, add -1 V (due to the voltage drop) and record in the installation record.

   Comment: Due to the inner voltage drop inside the LVD the battery voltage measured on the test terminals will be 1 V lower than the battery string voltage really.

10. Connect the battery cable connector J3 to the LVD.

11. Switch the battery circuit breaker to "ON".

12. It is recommended that the batteries stay connected to the rectifier.

Fiber test and installation

9

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Fiber test and installation

9

9.1 Principle of fiber cabling sequences

The fiber installation for the installer consists of routing the fibers:

- from the fiber termination box to the OAP for the *AnyMedia* Mainshelf, see Chapter 9.2.2, page 9-3

  and

- from the fiber termination box to the OCP for the ONU Subshelf respectively, see Chapter 9.3, page 9-6.

Splicing, main fiber routing and multifiber testing should have been done already.

The installation must be done for the *Anymedia* Mainshelf and for the ONU in different locations.

For cleaning optical connectors see Chapter 1.10.5, page 1-17.

9.2 General fiber information

Fiber routing

From the *AnyMedia*® Access System 8 optical links can be routed to 8 *AnyMedia* Optical Network Units (ONU) at maximum. If broadband applications are supported only 7 ONUs can be connected to the *AnyMedia* Mainshelf because the 16th slot is occupied by the AFM pack. The optical link is connected to the optical application pack (OAP) in the *AnyMedia* Mainshelf and routes to the optical controller pack (OCP) in the ONU Subshelf.

When the OCP or OAP is powered it will switch on its laser source. No automatic laser shutdown (ALS) is equipped in these packs because the laser sources of both packs are Laser Class 1 products.

WARNING: **Injury to eyes caused by invisible laser radiation.**

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches), direct exposure should always be avoided.
Don't look into the end of an exposed fiber or pack optical connectors as long as the optical source is switched on.
The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized.*
Always observe the laser warning instructions (see Chapter 1.10, page 1-12).

Also consider the fiber handling precautions, see Chapter 1.10.4, page 1-16.

Fiber connecting positions

The fiber cabling is vendor specific. Normally the fiber routing is as follows for most cases:

- From the OAP in the *AnyMedia* Mainshelf an SC/SC fiber routes to a fiber termination box with two fiber connectors inside.
- From this fiber termination box a pigtail runs to a fiber splice box where the fiber is spliced to the main multifiber which routes to the remote site where the ONUs are located.
- At the remote site there is also a splice box from which the spliced pigtails of the multifiber run to the fiber termination boxes of each ONU with two connectors inside.
- To the termination box the SC/SC fiber cable is connected, which runs to the OCP inside the ONU Subshelf.

This chapter describes the fiber cabling from the termination box to the OCP.

9.2.1 Optical link interface

The optical link works with a single fiber in which two wavelengths are used for transmit and receive. The OAP and the OCP are equipped with SC-type fiber connectors.

The parameter for the optical link are as follows:

Table 9-1 Parameters of the optical link

Parameter	Value / Description
Laser type	Laser transmitter of Laser Class I
Wavelength	1310 ±50 nm (upstream); 1550 ±50 nm (downstream)
Fiber	Single-mode, bidirectional (wavelength division multiplexing)
Connector type	Single connector, SC-type
Optical link range	about 15 km at least (or about 30 km for fibers with 0.4 dBm/km without splice/connectors ...)
Optical laser transmit average power	- 8 dBm min., ± 2 dBm max
Optical receive sensitivity	- 23.5 dBm or better, with 12 dB loss budget, including fiber, connectors, splices
Reflection	max. -20 dBm
Bit error rate (BER)	$\leq 1x10^{-10}$
Automatic laser shutdown (ALS)	No

9.2.2 Assumptions for the fiber installation on the *AnyMedia* Mainshelf side

This section describes the fiber cabling on the *AnyMedia Mainshelf* side!

The fiber installation at the *AnyMedia* Mainshelf side should have been done already as follows:

Step	Procedure
1.	At the *AnyMedia* Mainshelf side remove the protective caps of the delivered fiber and test the SC/SC fiber. For fiber testing follow local regulations. If not specified use optical power meter and optical light source (for

example: *Wavetek* OLP-6 or OLS-6 and OPL-15B or OLS-15). After testing put the protective caps on the fiber connectors. For the parameters of the optical link, see Table 9-1, page 9-3.

CAUTION:

Injury to eyes caused by invisible laser radiation during optical inspection with a microscope.

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is de-energized.*
Always observe the laser warning instructions (see Chapter 1.10, page 1-12).

2. If required clean the optical connectors to avoid loss of optical power or to avoid contamination of the second connector/coupling. If the fiber is cleaned always check the successful cleaning with an optical microscope (enlargement >40). For cleaning see Chapter 1.10.5, page 1-17.

3. Route the fiber from the fiber termination box to the OAP in the *AnyMedia* Mainshelf.

Optical cable break

IMPORTANT:

Fiber microdefects and/or cable break with a bending radius less than 30 mm.

There is a risk to cause microdefects in the single fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius for the single fiber is not less than 30 mm.
Always use the special protective spiral wrap of the fiber if equipped.
For the office fiber cable the allowed bending radius depending on the cable used must be observed.

4. Remove the protective caps of the fiber and place them inside the *AnyMedia* Mainshelf and in the termination box. The caps are required if the fiber is disconnected later.

5. Connect the fiber to the OAP and to the fiber termination box. Which fiber has to be connected to which OAP is specified in the engineering work order. Mark the fiber connector with the OAP number on the *AnyMedia* Mainshelf side.

   Comment: The SC-type connector is keyed. Therefore it must be correctly orientated before mating.

6. Mark the fiber in the termination box. The marking should be specified in the engineering work order or follow local regulations. If not specified it is recommended to mark the fiber just installed with the *AnyMedia* Main-shelf/OAP number and to mark the leaving fiber (towards the multifiber) with the ONU Subshelf identifier (ONU addressing) and with the ONU destination location.

7. Be sure that the main multifiber cable has been tested successfully with an optical time domain reflectometer (for example: *Wavetek* MTS5100) for each fiber from termination box to termination box.

9.3 Fiber cabling of the ONU

For the ONU the fiber cabling should be done as follows:

1. Locate one separately delivered fiber cable per ONU with an SC-type fiber connector on each side:

Table 9-2 Delivered fiber cable for the ONU Subshelf

Designation	Comcode	Equipment description	Length
Fiber Jumper Cable[a]	408267532	Fiber Jumper Cable with SC/SC connector, with protective spiral wrap of about 3 ft (≈1 m) on the ONU side	30 ft (≈10 m)

a Two fibers are delivered, one is for spare.

2. If required remove the protective caps of the delivered fiber and test the SC/SC fiber. For fiber testing follow local regulations. If not specified use an optical power meter (for example: Wavetek OLP6/OLS16). After testing put the protective caps on the fiber connectors.

3. If required clean the optical connectors to avoid loss of optical power or to avoid contamination of the second connector/coupling. If the fiber is cleaned always check the successful cleaning with a microscope (enlargement >40). For cleaning see Chapter 1.10.5, page 1-17.

WARNING:

Injury to eyes caused by invisible laser radiation during optical inspection with a microscope.

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.
The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized.*
Always observe the laser warning instructions (see Chapter 1.10, page 1-12).

4. If not already done remove the cable access cover on the right side of the ONU.

5. Route the tested fiber from the fiber termination box in the separate fiber trunk to the ONU Subshelf.

Optical cable break

IMPORTANT: **Fiber microdefects and/or cable break with a bending radius less than 30 mm.**

There is a risk to cause microdefects in the single fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius for the single fiber is not less than 30 mm.
Always use the special protective spiral wrap of the delivered fiber jumper on the ONU side.

6. Mark the fiber in the termination box. The marking should be specified in the engineering work order or follow local regulations. If not specified it is recommended to mark the fiber just installed with the ONU Subshelf identifier (ONU addressing) and to mark the incoming fiber (from the multifiber) with the OAP slot position and *AnyMedia* Mainshelf destination location.

7. Remove the protective cap of the fiber and place them inside the termination box. The cap is required if the fiber is disconnected later.

8. Connect the fiber in the termination box. Which fiber has to be connected to the OCP is specified in the engineering work order if more than one ONU is located on the site.

9. Insert the fiber with the protective spiral wrap side through the right opening of the ONU housing and route it below the ONU Subshelf to the OCP position.

Optical cable break

IMPORTANT: **Fiber microdefects and/or cable break with a bending radius less than 30 mm.**

There is a risk to cause microdefects in the single fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius for the single fiber is not less than 30 mm.
Always use the special protective spiral wrap of the delivered fiber jumper on the ONU side.

10. Mark the fiber connector with the ONU Subshelf identifier (ONU addressing) if more than one ONU is located on the site.

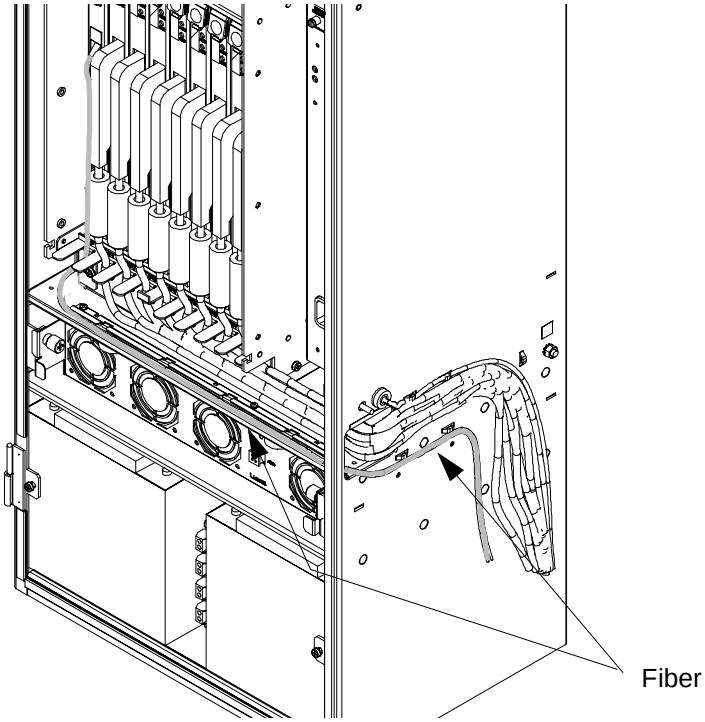

Figure 9-1 Fiber routing

11. If the OCP is already inserted remove the protective cap from the SC-type fiber connector of the OCP and place it inside the ONU Subshelf. Orient the mating fiber connector so that the fiber routes upwards towards the OCP. For cabling arrangement inside the ONU Subshelf see also Figure 6-1, page 6-3. Arrange the fiber so that it reaches the grounding bracket fingers of the ONU Subshelf directly below the OCP and affix with cable tie.

12. If no OCP is inserted do not affix with cable tie. Locate the protective cap and add to the fiber connector so the fiber is protected against impurification. Move the fiber connector between the left ONU housing side and the ONU Subshelf where the fiber is protected.

13. Move the fiber with its spiral wrap under the fiber fixing bar in the front of the ONU Subshelf so that the fiber is protected against mechanical stress. For location of the fiber fixing bar see Figure 9-2, page 9-9 below.

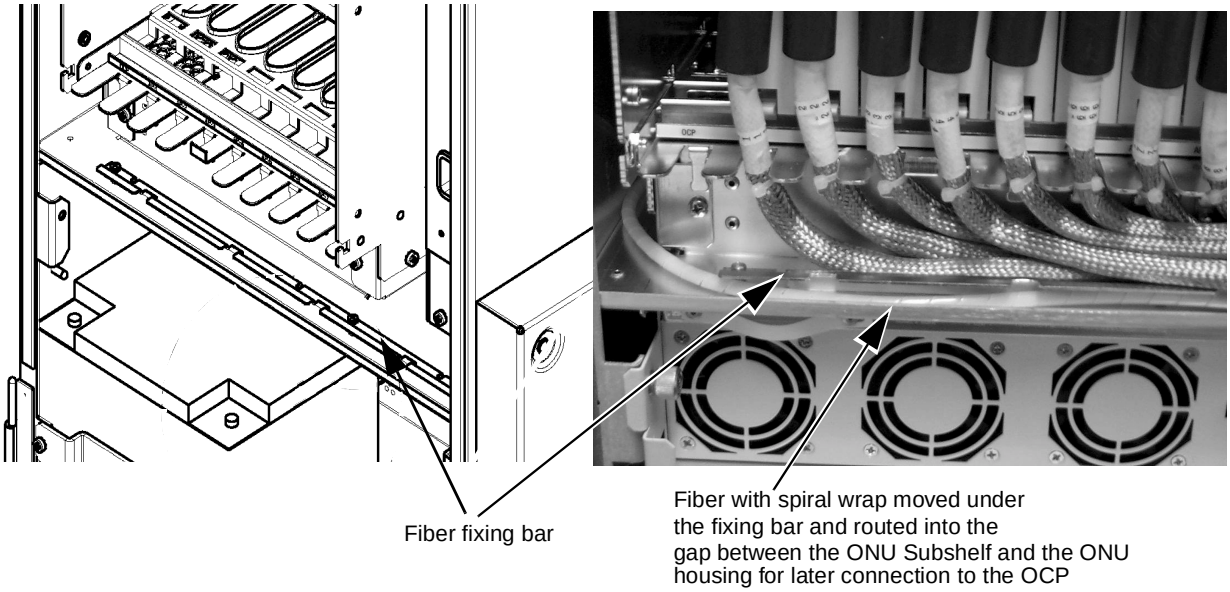
Fiber fixing bar
Fiber with spiral wrap moved under
the fixing bar and routed into the
gap between the ONU Subshelf and the ONU
housing for later connection to the OCP

Figure 9-2 Location of the fiber fixing bar and placing the fiber under the fixing bar

14. Arrange the fiber with the already installed a/b cables routing on the right side of the ONU housing and fix it horizontally. Add cable ties as needed so that the fiber is affixed separately as can be seen in Figure 9-1, page 9-8.

15. On the back of the right side of the ONU housing route the fiber at 90 degrees upward or downward as required and fix it to the wall. Bear in mind that the fiber should not be stressed mechanically.

Optical cable break

IMPORTANT: **Fiber microdefects and/or cable break with a bending radius less than 30 mm.**

There is a risk to cause microdefects in the single fiber or a risk of a cable break if the bending radius of optical fiber cables is less than about 30 mm. Microdefects can increase the fiber attenuation and reduce the long term stability.
Ensure that the bending radius for the single fiber is not less than 30 mm.
Always use the special protective spiral wrap of the delivered fiber jumper on the ONU side.

16. Mount the cable access cover.

Equipping the ONU Subshelf

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Equipping the ONU Subshelf

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10.1 Installing sequence

For installing the OCP and the application packs into the ONU Subshelf it must be checked that the ONU is powered correctly and the engineering work order is available, see Chapter 10.2, page 10-1.

The installing order should be carried out as follows:

- Install the OCP and connect the already inserted fiber, see Chapter 10.3, page 10-2.
- Remove the a/b-cables and blank faceplates from the positions where packs have to be installed, see page 10-7.
- Install the APs in the positions as stated in the working order and reconnect the already installed a/b-cables, see Chapter 10.4, page 10-7.

10.2 General information for installing the packs

This section describes the procedures for providing the ONU with the optical controller pack (OCP) and with the application packs for POTS, ISDN, ADSL and/or HDSL.

The assumptions and conditions for these procedures are as follows:

- Planning procedure for cabling, powering and installation has been done properly and an engineering work order is available for:
  - — Type and location of needed packs
  - — ONU Subshelf identifier (address)
  - — How/where to connect the application pack cables to the MDF

- The ONU has been properly installed and is powered up
- Cabling has been completed and verified.

For testing the APs of the ONU the optical link must work properly. That means for the optical link:

- the OAP is inserted in the *AnyMedia* Mainshelf
- the continuity of the complete fiber connection is checked
- the optical link is already provisioned in the *AnyMedia* Mainshelf
- the ONU addressing is correct
- the OCP and the APs are installed in the ONU Subshelf
- The PC GSI connected to the RMC connector of the OCP.

10.3 OCP installation at ONU Subshelf

Background

The installation of the OCP in the ONU Subshelf is the same as the installation of the OAP in the *AnyMedia* Mainshelf. To prevent a malfunctioning pack from being installed in a disconnected subshelf without recognizing the failure on-site, the system uses the existing fault LED indicators of the packs to indicate recognized hardware or sanity test failures.

To install the OCP proceed as follows:

Step	Procedure
1.	Open the ONU door.

CAUTION:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. Ensure that your electrostatic discharge (ESD) wrist strap is secure.
Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
Pay attention to the ESD safety guidelines in Chapter 1.8.2, page 1-8.

2.	Attach the electrostatic discharge (ESD) wrist strap that must be grounded on the ONU Subshelf.
3.	Verify that the ONU Subshelf identifier (ONU addressing) on the DIP switch is adjusted to the value stated in the engineering work order. For adjustment see Chapter 8.1.1, page 8-1.
4.	Move the already installed fiber aside carefully so that the outermost left position in the ONU Subshelf is free for the OCP.

5. For inserting you must have the following pack:

Table 10-1 OCP pack

Pack designation	Comcode	Apparatus Code
Optical Controller Pack (OCP)	108741265	CPF500, Issue 2:3

6. Insert the OCP into the slot marked OCP (for the location of the slot see figure below).

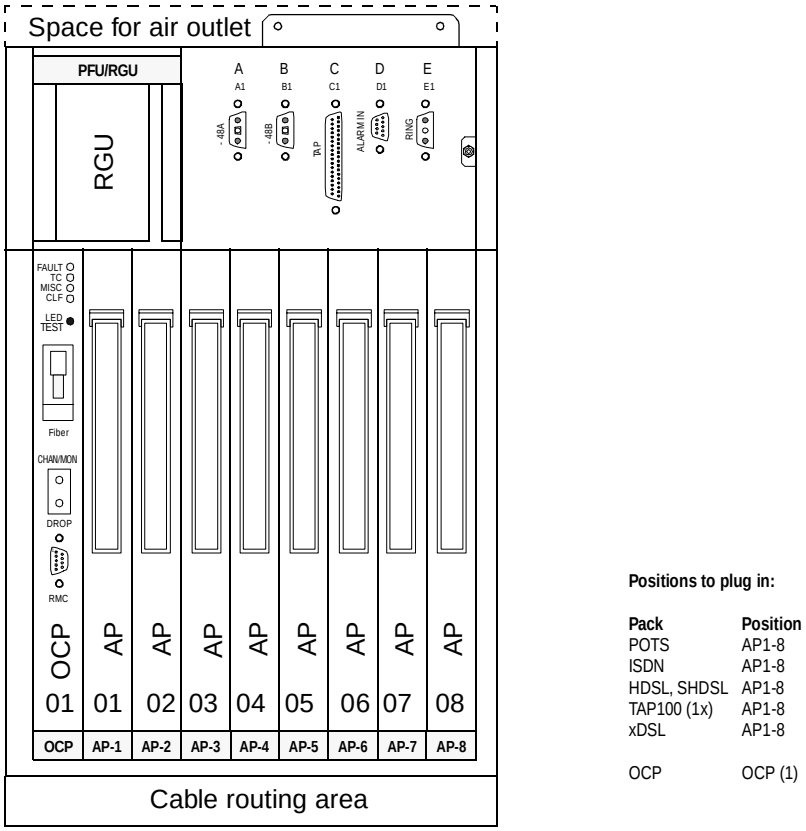

Figure 10-1 Pack arrangement of the ONU Subshelf

7. With the latches in the open position (swung out), slide in the OCP until the faceplate reaches the metalwork of the shelf. This means the top portion of the upper latch is behind the upper lip of the shelf and the bottom

portion of the lower latch is behind the lower lip of the shelf. Lock the OCP in position by pressing firmly on the rounded indentation on both top and bottom latches simultaneously until they click into place, see figure below.

CAUTION: **Destruction of LEDs by improper handling of packs.**

The LEDs which protrude through the openings in the faceplate of the pack can be damaged by pressing on the LEDs during pack installation.
When installing a pack place your thumbs on the rounded indentations of the latches to lock the pack. Take care and do not use your palm because your hand may slip and break the LEDs.

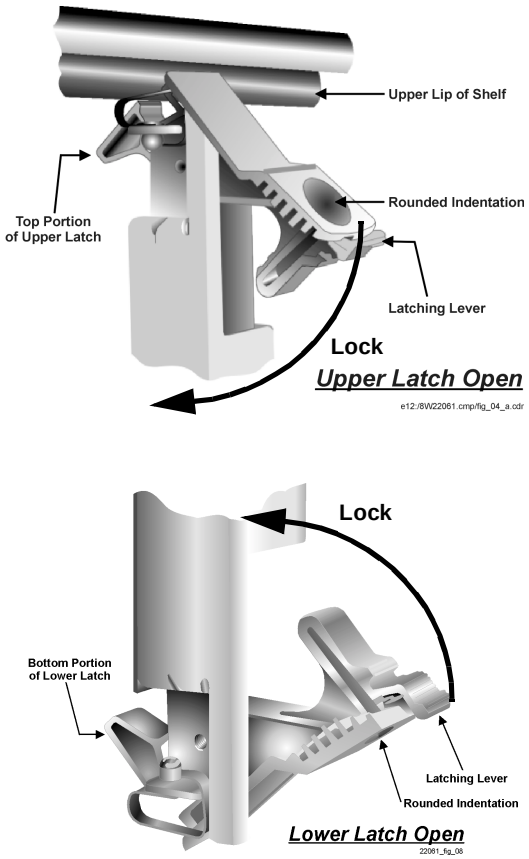

Figure 10-2 Upper and lower latch of a pack (shown in open position)

Response: Upon OCP power-up, all LEDs on the OCP light for a short interval if the ONU is powered up already. During OCP self-initialization no LEDs on the OCP light. Self-initialization lasts no more than one minute.

Step 8. Locate the already installed fiber and remove the protective caps on the fiber connector and on the OCP fiber connector. Put them inside the ONU Subshelf so that they can not get lost. The caps are required if the cable has to be disconnected for e.g. maintenance or replacing actions.

Step 9. Bear in mind that the fiber can be energized already.

CAUTION: **Injury to eyes caused by invisible laser radiation.**

Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches) direct exposure should always be avoided.

10. It is recommended to check the receiving laser power with the optical power meter. For the transmission parameters see Table 9-1, page 9-3. If there are problems try to clean the optical connector. If the fiber is cleaned always check the successful cleaning with an optical microscope (enlargement >40). For cleaning see Chapter 1.10.5, page 1-17.

WARNING: **Injury to eyes caused by invisible laser radiation during optical inspection with a microscope.**

The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
Although, at present, the transmitting power levels for Class 1 lasers are below those known to cause injury to the eye at distances greater than 250 mm (≈10 inches), direct exposure should always be avoided.
The OCP does not have an Automatic Laser Shutdown (ALS) feature compliant with ITU-T G.958 and IEC 60825. The internal laser source is on as soon as the OCP is powered. This must be considered especially before checking the fiber with an optical microscope.
***Never** view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE of FJW Optical Systems, Inc., since viewing optics tend to collimate the energy from an optical connector and, hence, increase the potential risk of injury.*
***Never** view any unterminated optical connector with optical microscope as long as the laser source is switched on. **Always** test with an optical power meter that the fiber is deenergized and ensure that the laser source can not be activated during inspection with the microscope.*
Always observe the laser warning instructions (see Chapter 1.10, page 1-12).

Step 11. Connect the already installed fiber to the SC-type fiber connector of the OCP. Pay attention the SC connection has a guiding system so that the fiber connector can be inserted in one direction only.

Step 12. Be sure that the fiber is connected properly in the fiber termination box.

Step 13. If the ONU is powered and the *AnyMedia* Mainshelf is also powered up and equipped with the corresponding OAP to which the fiber is connected, the optical link will be checked automatically by the OAP/OCP. The yellow CLF LED on the OCP faceplate will extinguish.

Step 14. To check that the communication with the system works properly press the LED TEST button on the OCP.

Response: All LEDs on the OCP faceplate light for approximately 10 seconds; then the LEDs return to their previous status.

IF...	**THEN check for one of the following failures:**
the FAULT LED lights permanently	– OCP is faulty
the FAULT LED remains dark	- the OCP may be faulty; try another OCP and repeat beginning with Step 6.
If the LED CLF on the optical controller pack for ONU lights permanently	- a fault or a facility alarm has occurred on the optical link (carrier line failure) or - the optical link between the OAP and the OCP is not connected or the OAP is not powered up.

NOTE:
The OCP and the correctly connected optical link can only be used when the OAP and the ONU Subshelf are defined via TL1 commands (server port and feeder port), the OAP and the ONU Subshelf are cross-connected and the ONU is in the service state IS. Also, the ONU Subshelf identifier adjusted on the 8-fold DIP switch must correspond to the logical subshelf number. The TL1 commands required are:

- ENT-AP for defining the OAP
- ENT-SUBSHELF for defining the ONU Subshelf
- ENT-CRS-SUBSHELF for crossconnecting OAP and ONU Subshelf
- ED-SUBSHELF for moving the ONU in service.

For a detailed description, see the *Turn-Up Procedures* described in the *Commands and Procedures for Narrowband Services*, subsection *Provisioning of the ONU Subshelf*.

10.4 AP installation

Background

The installation of the APs in the ONU Subshelf is the same as in the *AnyMedia* Mainshelf. To prevent the case that a malfunctioning pack from being installed in a disconnected subshelf without recognizing the failure on-site, the system uses the existing fault LED indicators of the packs to indicate recognized hardware or sanity test failures.

To install the APs proceed as follows:

Step	Procedure
1.	Attach the electrostatic discharge (ESD) wrist strap that is grounded on the ONU Subshelf.

CAUTION:

Destruction of components by electrostatic discharge.

Electronic components can be destroyed by electrostatic discharge. Ensure that your electrostatic discharge (ESD) wrist strap is secure.
Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
Pay attention to the ESD safety guidelines in Chapter 1.8.2, page 1-8.

2. Detach the a/b cable connectors from the blank faceplates (AP1 to AP8) which are specified in the engineering work order and let the disconnected a/b-cable hang out. The connectors have a snap-in fixing only.

3. Pull out the blank faceplate from which the connectors have been removed.

4. Move the already installed a/b-cable aside to the left so that the AP position in the ONU Subshelf is free for the AP. Do not cut or remove the cable tie which connects the cable screen to the grounding finger.

5. For equipping the slots AP1 to AP8 the following APs are available and you must have at least one of the APs specified below:

Table 10-2 Application packs available for AP1 to AP8

Pack designation	Comcode	Apparatus Code
POTS AP (without PPM), 32 Z ports	108463241	LPZ100C
POTS AP (with PPM), 24 Z ports	108134719	LPP100B
POTS AP, country-specific, 32 Z ports[a] (without PPM, reduced TAP capability, fixed balance network and fixed termination impedance)	108692971	LPZ120B
	108692989	LPZ121B
	108692997	LPZ122B
ISDN AP (2B1Q), 12 U ports	108506387	LPU112

Table 10-2 Application packs available for AP1 to AP8 –*Continued*

Pack designation	Comcode	Apparatus Code
ISDN AP (4B3T), 16 U ports	108488396	LPU430
SHDSL AP with 8 duplex-mode SHDSL ports and 4 duplex E1 ports (unstructured)	108708835	LPS510
HDSL AP for 4 ports (V5 ISDN PRA, V3 ISDN PRA, VLL, GLL, 2 duplex E1 ports (unstructured))	108905332	LPS504[b]
Test Application Pack (Metallic Test Pack)	108045360	TAP100
ADSL4p AP (4 ADSL ports/4 splitters for Z ports)	108603945	LPA400B[c]
ADSL8p AP (8 ADSL ports/8 splitters for Z ports)	108550005	LPA408
ADSL16p AP (16 ADSL ports/16 splitters for Z ports)	108708827	LPA416
ADSL16p AP (16 ADSL ports/16 splitter for Z ports, low resistance test path)	109026567	LPA419
ADSL4i AP (4 ADSL ports/4 splitters for ISDN ports (with 2B1Q/4B3T)	108610932	LPA414
ADSL16i AP (16 ADSL ports/16 splitters for ISDN ports (with 2B1Q/4B3T)	108796343	LPA417
SDSL16 AP (with 16 SDSL ports)	108695529	LPS716

a LPZ120B used for China, LPZ121B used for Taiwan, LPZ122B used for Brazil. For details please ask your local Customer Team.

b The formerly deliverable HDSL APs LPS501 (108447996; V5 ISDN PRA, VLL, GL) and LPA/503 (108841925; V5 ISDN PRA, V3 ISDN PRA, VLL, GLL) are replaced by the LPS504 for newly deployed ONUs.

c The formerly deliverable ADSL4 APs LPA400 (108603945; no G-lite) are replaced by the LPA400B for newly deployed ONUs.

6. Insert the first application pack (AP) into one of the available AP slots, as specified in the engineering work order. For the positions of the APs see the Figure 10-1, page 10-3.

7. With the latches in the open position (swung out), slide in the AP until the faceplate reaches the metalwork of the shelf. This means the top portion of the upper latch is behind the upper lip of the shelf and the bottom portion of the lower latch is behind the lower lip of the shelf. Lock the AP in

position by pressing firmly on the rounded indentation on both top and bottom latches simultaneously until they click into place, see Figure 10-2, page 10-4.

CAUTION: **Destruction of LEDs by improper handling of packs.**

The LEDs which protrude through the openings in the faceplate of the pack can be damaged by pressing on the LEDs during pack installation.
When installing a pack place your thumbs on the rounded indentations of the latches to lock the pack. Take care and do not use your palm because your hand may slip and break the LEDs.

NOTE:
The APs and the OCP are keyed differently. It is not possible to plug an AP into the OCP slot and vice versa.

8. Attach the a/b cable connector to the faceplate connector: Raise the ejector on the AP faceplate until the entire slot is visible. For the insertion/removal procedure see Chapter 6.3.3, page 6-4.

IMPORTANT: **Disconnection of faceplate connector.**

Do not press down on the rounded indentation on the top of the slider. Pressing down on the rounded indentation on the top of the slider causes the faceplate connector to disconnect. This action affects customer service.

9. Align the top of the faceplate connector with the top of the slot. Press the faceplate connector firmly until it clicks into place.

   Response: Upon power-up and sanity test, the Fault LED on the AP lights for a short interval.

NOTE:
If the *AnyMedia* Mainshelf is equipped with the COMDAC, the ONU Subshelf is equipped with the OCP already and the optical link works properly then the FAULT LED flashes at a rate of 1 Hz during AP self-initialization. Self-initialization lasts no more than one minute.

IF…	THEN check for one of the following failures:
the FAULT LED lights permanently	– faceplate connector is not plugged in – faceplate connector is faulty – cable is faulty – application pack is faulty
the FAULT LED remains dark (does not light during power-up)	- the AP may be faulty; try another AP and repeat beginning with Step 6.
the FAULT LED remains dark on the second AP too	- probably the power supply is faulty: Are the failure LEDs extinguished on the PRU of the rectifier shelf - If not, the power cable connection may be faulty; check the A1 connector on the ONU Subshelf and measure the voltage if required; for pinning see Figure 4-6, page 4-11.

NOTE:
Some of the failure causes can only be monitored if the optical link works properly, especially AP connector and AP cable are tested via the optical link.

10. Repeat Step 2. through 9. for all APs listed in the engineering work order.

NOTE:
The application pack can be used for service only, when it is provisioned by entering the TL1 commands ENT-AP ... ED-SUBSHELF in the *AnyMedia* Mainshelf and when the optical link works properly, see also the note on page page 10-6.

NOTE:
If the optical link works properly the LED on the APs can be checked by pressing the LED TEST button on the OCP.

Response: All LEDs on the OCP faceplate and on the faceplates of the APs light for approximately 10 seconds; then the LEDs return to their previous status.

Maintenance of the fan unit and of batteries

11

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Maintenance of the fan unit and of batteries

11

11.1 General maintenance information

For the *AnyMedia*® Optical Network Units (ONU) maintenance work is required on the batteries and on the fan unit.

IR-30EC batteries have a guaranteed lifetime of 5 years. In accordance with the Product Manual for IR-30EC and IR-40EC batteries the batteries should be replaced after 5 years to ensure performance.

Depending on the working conditions the batteries should be replaced at a shorter interval if the ambient temperature has been permanently in the range above 25°C.

NOTE:
Operating the IR-30EC battery for any length of time above 25°C (77° F) will result in reduced performance and premature failure. Operation or storage for a significant interval of time above 50°C (122° F) may reduce or void the product warranty.

The fan filter should be checked for cleaning or replacement 2 months after the initial installation. Then the fan filter should be checked at a maximum interval of 6 months.

The fan filter must be replaced after noticeable restrictions in air movement over electronics or if first signs of overheating occur.

NOTE:
The lifetime of the filter depends on environmental conditions.

Depending on the working conditions the fan unit should be replaced after 40,000 working hours (about 4 years and 7 months if working 24 hours a day).

Any defective fan unit must be replaced immediately.

11.2 Principle of maintenance sequences

The maintenance works required must be carried out at different intervals for the fan unit and for the batteries.

For the batteries the Installation and Maintenance Record must be filled out and signed.

In the installation and maintenance record the maintenance personnel must record different measurable parameters during maintenance work. These parameters must be recorded at quarterly intervals by the maintenance person. The completed forms will be used for any future warranty claims.

11.3 Maintenance of the fan unit

The fan filter should be checked for cleaning or replacement 2 months after the initial installation. Then the fan filter should be checked at a maximum interval of of 6 months. For extreme purification conditions which are not conform to ETS 300 019-1-3, Class 3.2, the filter must be cleaned or replaced at shorter intervals.

Also the fan should be visually inspected for extreme impurification and dust during this work.

Depending on the working conditions the fan unit should be replaced after 40,000 working hours (about 4 years and 7 months; the fans work as long as they are powered).

11.3.1 Cleaning the fan filter

The fan filter can be cleaned externally by low-pressure warm water or with a vacuum cleaner.

For vacuum cleaning always consider that the cleaning airflow must be reverse to the operational airflow. Vacuum the intake side only!

For washing the filter use low-pressure warm water and mild detergents (no chlorine or bleach). Rinse from the exhaust side and push dirt out.

The fan filter should be replaced after noticeable restrictions in air movement over electronics, if first signs of overheating occur or if the filter is destroyed - partly or completely. Depending on the filter manufacturer the fan filter must also be replaced when the number of allowed cleaning cycles - as stated in the data sheet - is reached.

11.3.2 Checking and replacing the fan filter

The fan filter can be replaced in during operation. The fan must not be de-energized. If a spare filter is available the fan filter can be replaced and the removed filter can be cleaned externally in the meantime by low-pressure warm water or with a vacuum cleaner.

For replacing the filter proceed as follows:

Step	Procedure

1. For replacing the fan filter you must have the following:

Table 11-1 Fan filter for replacement

Designation	Comcode	Apparatus Code
Fan filter FF-X55 (Class 2, 324A)	848456943	NA

2. Locate the fan filter directly above the fan unit and pull out the filter using the two plastic loops, see figure below.

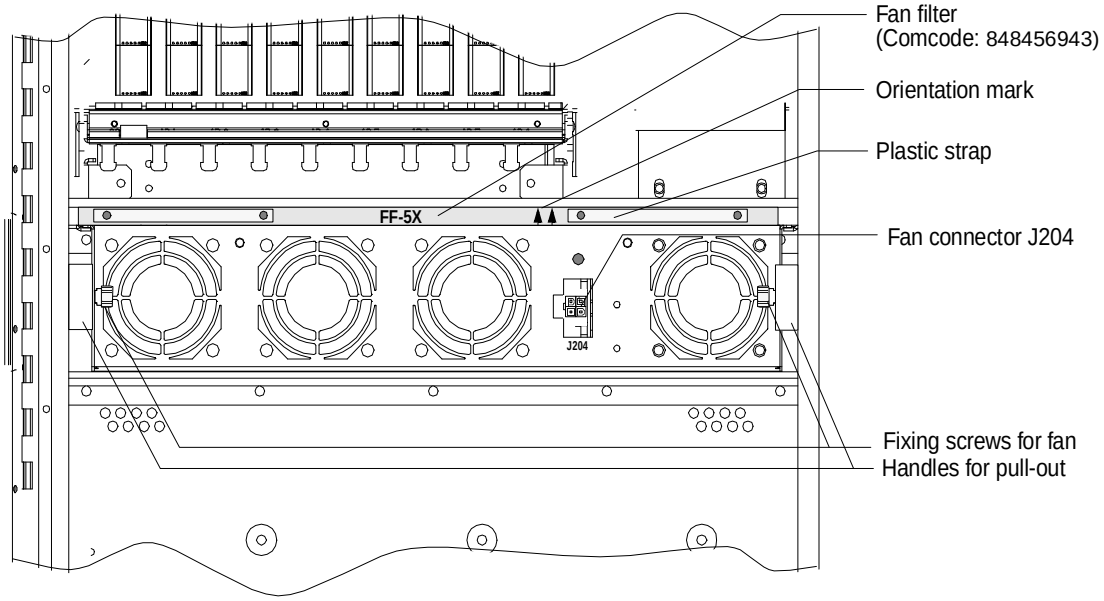

Figure 11-1 Position of the fan unit with the fan filter and the mounting elements

3. Take the new filter and locate the two arrows on the metalwork of the filter. The filter may only be inserted when the arrows point upwards. For your help the arrows point upwards if the marked filter designation (for example: "FF-X5") is not upside down.

4. Orient the filter so that the arrows point upwards (or the marked filter designation is readable in the upright) and slide in the filter in the correct orientation. Push firmly to the back until the filter no longer protrudes.

11.3.3 Replacing the fan unit

For replacing the fan unit proceed as follows:

Step	Procedure

1. For replacing the fan unit and the fan filter you must have the following:

Table 11-2 Fan unit for replacement

Designation	Comcode	Apparatus Code
7A fan unit (C-1669, No. 848403754-A)	108583428	N.A.
Fan filter FF-X55 (Class 2, 324A)	848456943	N.A.

2. Locate the filter cable connector J204 on the right side of the fan unit and disconnect.

3. Remove the fan filter and dispose of in the correct manner.

4. Loosen the two fixing screws with about 7 turns. The screws are captive screws.

5. Pull out the fan unit using the two handles. Take care that the fan cable is not squashed. Push the cable to the right side.

6. Remove the fan unit and dispose of in the correct manner.

7. Insert the new fan unit. Move the fan cable down and to the right so that it cannot be squeezed.

8. Tighten the two fixing screws.

9. Take the new filter and locate the two arrows on the metalwork of the filter. The filter may only be inserted when the arrows point upwards. For your help the arrows point upwards if the marked filter designation "FF-X5' is not upside down.

10. Orient the filter so that the arrows point upwards (or the marked filter designation is readable in the upright) and slide in the filter in the correct orientation. Push firmly to the back until the filter no longer protrudes.

11. Connect the fan cable to connector J204. The fan unit must work and the red LED Fan Alarm is not allowed to light.

12. Check visually or by listening that all fans in the fan unit work properly, check the air current above the ONU and above the rectifier shelf.

11.4 Battery maintenance

11.4.1 General for maintenance

Maintenance routines

Maintenance routines for batteries are simple compared to flooded batteries. Proper maintenance ensures good performance. The maintenance routines are divided into two groups. Table 11-3 provides the required maintenance procedures and intervals for the batteries. The intervals in Table 11-3 are the maximum allowed.

In all cases consider the regulations given by the manufacturer of the batteries. If, for other batteries, the corresponding battery manual instructs you to maintain the batteries other than described in this chapter please follow those instructions.

NOTE:
Failure to adhere to these maintenance schedules will void the warranty for IR-30EC batteries.

Be aware that maintenance work can interrupt the battery buffering for the ONU Subshelf. A loss of AC mains during maintenance will cause a shut-down of the complete ONU.

11.4.2 Maintenance intervals for IR-30EC batteries

If required, perform the maintenance routines more frequently. Table 11-4 lists the manufacture-suggested routines for IR-30EC batteries. Each of these routines is described additionally in this chapter. You can use the manufacturer's installation and maintenance record forms or the copies of the Installation and Maintenance Record which can be found in Chapter 11.5, page 11-18.

Maintenance intervals

For IR-30EC batteries the following maintenance intervals are mandatory.

Table 11-3 Required maintenance intervals for IR-30EC batteries

Routine	Action	Interval
Battery string voltage	Measure / record	Quarterly
Battery string current	Measure / record	Quarterly
Battery voltage	Measure / record	Quarterly
Battery temperature	Measure / record	Quarterly
Inter-battery connections	Inspect	Quarterly
	Clean (if necessary)	As needed
Inter-battery connections	Retorque if the 14 AWG lead has been replaced	As needed

Table 11-4 Suggested maintenance routines (additional)

Routine	Action	Interval
Discharge test	Measure/ record	Optional

11.4.3 Required tools

Tools

You will need the following tools and materials to install and test the battery string:

- Splash-proof safety goggles, acid-resistant gloves, rubber overshoes and apron
- Cleaning cloth
- Lime and/or soda (sodium bicarbonate or sal soda)
- Insulated socket drive or nut driver set (1/4-inch through 3/4-inch sockets) and torque wrench (0 to 60 in-lbs, 6 Nm) for maintenance/replacement
- Sandpaper or abrasive cloth (for cleaning the battery compartment only!)
- DMM (Digital Multimeter), for example, Tek DM254 or *Fluke* 8060A or equivalent. (The accuracy of an equivalent meter should be 0.05 percent on the DC scale)
- Current converter/transformer or current probe 1:10 for multimeter used for up to 20 A
- Thermometers for measuring the ambient temperature and the battery temperature (contact type)

For safety a Class C fire extinguisher should be reachable.

11.4.4 Safety

Battery handling

For safe battery handling always take the following basic precautions:

- Use only properly insulated tools and test equipment.
- Remove all metallic objects (key chains, glasses, rings, watches, or any other jewelry).
- Wear safety glasses.
- Test circuits before touching.
- Lock out and tag any circuit breakers/fuses when possible to prevent accidental turn-on.
- Be aware of potential hazards before servicing equipment.
- Identify exposed hazardous electrical potentials on connectors, wiring, etc. (Note the condition of these circuits, especially any wiring.)
- Take care when removing or replacing any covers; avoid contacting any circuits.
- For cleaning batteries use a damp soft cloth only. Do not use solvents, paraffin, abrasive or proprietary cleaning fluids.

Short-circuit

DANGER:

Destruction of batteries in the event of a short circuit.

A short circuit in the batteries will cause destruction by arcing of batteries and cables and thus malfunctioning of the complete system.
Be aware of potential hazards before servicing battery equipment.
You must always use properly insulated tools and test equipment for installing and connecting batteries.
When working on batteries always wear splash-proof safety goggles, acid-resistant gloves, rubber overshoes and an apron.

Maintenance rules

While maintaining the batteries, you must:

- **Never** place metal objects (including tools) on top of a battery.
- **Never** short out the battery's terminals.
- **Never** use an open flame near batteries.

Precautions

All lead-acid batteries generate hydrogen gas, even under open circuit conditions. If not permitted to escape, this gas can build up to explosive concentrations.

NOTE:
Any mechanical power switches - even electrostatic voltages - are sources of spark gaps!

An explosion could occur when sparks are created near the battery string. Check that the batteries are not charging or discharging before loosening or removing battery connections as sparks may occur. As always, adequate ventilation must be provided.

GMT fuses The GMT-type fuses in the low voltage disconnect unit (LVD) can produce sparks during interruption or clearing of a fault on a high energy circuit. Use only GMT fuses manufactured by Lucent Technologies.

Battery connections Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections.

Electrolyte contact In the event of electrolyte contact with the skin, remove the electrolyte immediately by rinsing the affected area with large amounts of plain tap water. In the event of electrolyte in the eye, pour water into the inner corner of the eye and allow at least one liter of water to run over the eye and under the eyelid. Eye injuries should be treated by a physician immediately.

Acid spillage If large acid spillage occurs, use agricultural or industrial lime instead of soda for neutralization before cleanup. If lime is not available, you may use baking soda. Wear eye protection devices and rubber gloves when using lime on electrolyte spills. Sprinkle the lime on the spillage; allow it to absorb the electrolyte, and then sweep it up and dispose of it in the proper manner. Wash hands and face thoroughly after cleanup.

11.4.5 The correctness of the battery string float voltage

Float voltage It is extremely important to maintain the battery at the proper float voltage. The float voltage is determined as follows:

Battery string voltage = recommended float voltage per battery × number of batteries.

The float voltage required is ambient temperature dependent. The PRU will adapt this charging voltage with -72 mV/°C, see Figure 2-5, page 2-13.

The recommended float voltage per IR-30EC battery is **13.5 V ±0.06 V** at a battery temperature of 25°C.

For example, a 4-battery string of IR-30EC batteries should be floated at:

Battery string voltage = 13.5 V × 4 batteries = 54.0 V ±0.24 V

NOTE:
The required charging voltage is different for other battery types. The values given by the battery manufacturer must be observed.[1]

A Fluke 8060A DMM (digital multimeter) is suitable for battery voltage readings. The accuracy of an equivalent meter should be 0.05 percent on the DC scale. Check the meter periodically for accuracy and calibration.

1 For other batteries, for example for Tyco 12 IR 125 batteries, a float voltage of 13.62 V ± 0.06 V per battery at a battery temperature of 25°C is recommended (string voltage ≈ 54.5 V).

11.4.6 Measuring the voltage of the battery string

Read battery string voltages periodically to ensure that they are floating properly.

There are two ways to measure the string voltage on the battery cable connector J3:

- Measure on the wiring side of the battery cable connector J3 plugged in the LVD by inserting the probes into the opening for the wires using small test probes
- Measure on the contact side of the battery cable connector J3 disconnected from the LVD by inserting the probes into the contacts.

Be aware that maintenance actions will interrupt the battery buffering for the ONU Subshelf if the battery circuit breaker is switched OFF and J3 is disconnected. A loss of AC mains during maintenance will cause a shut-down of the complete ONU.

Instruction

For measuring the string voltage proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record where the battery readings, the installation date and the first readings have already been recorded, see Chapter 7.3.4, page 7-11, *Warranty and installation and maintenance record*. *Requirement:* Be aware to be at uninterrupted float for 48 hours at least.
2.	Switch the battery circuit breaker to OFF, locate the 3-pin battery cable connector J3 and disconnect. For pinning of J3 see Figure 11-2, page 11-10.

Short-circuit when taking voltage readings

WARNING:

Risk of a short or arcing due to battery cabling without fuse protection.

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an arc destruction of batteries and cables and thus malfunctioning of the complete ONU.
Use insulated probes for measuring.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken.

3. Measure the battery string voltage on the outermost connector pins. The outer pin with the black wire is the negative terminal of the battery string. Record the string voltage in the installation record.

   Requirement: The string voltage must be at least: **51.2 V**.

   Comment: Between the middle pin and the outer "-" pin (black wire) you will measure the string voltage of batteries 4 and 3, between the middle pin and the outer "+" pin (red wire) you will measure the string voltage of batteries 1 and 2.

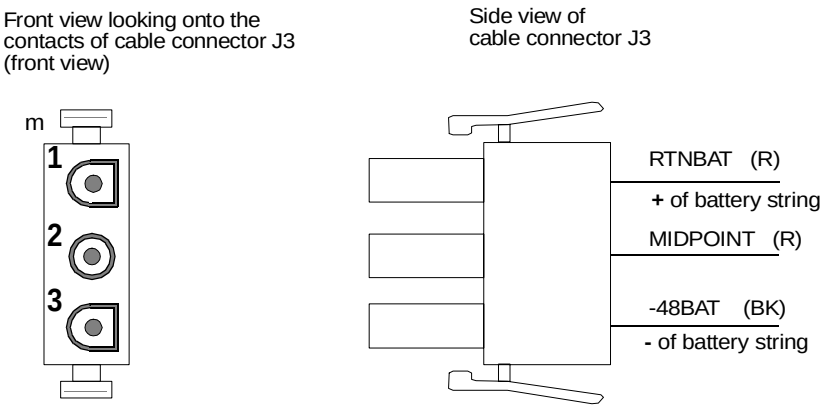

Figure 11-2 Pinning of battery cable connector J3

You can also measure the string voltage without interrupting the buffering by measuring on the wiring side of the battery cable connector J3 plugged in the LVD by inserting the probes into the opening for the wires using small test probes.

11.4.7 Measuring the string current

The battery string current can be measured with a pliers-shaped DC current converter or current probe 1:10 for multimeter used for up to 20 A.

Instruction

For measuring no cable need to be disconnected. Proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record where the battery readings, the installation date and the first readings have already been recorded, see Chapter 7.3.4, page 7-11, *Warranty and installation and maintenance record*.
2.	Connect the current probe to the probe tips, locate the battery cable, open the probe pliers and insert the battery cable.
3.	Record the string current into the installation record.

11.4.8 Measuring the voltage of a single battery

General

The individual battery voltages should be measured periodically to ensure that they are floating properly. Readings for each battery must be within ±0.18 V of the string average.

NOTE:
The string average is calculated by dividing the string voltage by the number of batteries in the string.

Additionally the power rectifier unit is equipped with a supervision component which compares the voltage of batteries 1 and 2 (1st partial string) to the voltage of batteries 3 and 4 (2nd partial string). The allowed difference is ≤1.7 V. Values >1.7 V will generate a balance failure in the rectifier.

Instruction

For measuring the batteries must be disconnected from the rectifier.

Be aware that this action will interrupt the battery buffering for the ONU Subshelf if the battery circuit breaker is switched OFF and the battery connectors Batt1 to Batt4 are disconnected. A loss of AC mains during maintenance will cause a shutdown of the complete ONU.

For measuring the single battery voltage proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record where the battery readings, the installation date and the first readings have already been recorded, see Chapter 7.3.4, page 7-11, *Warranty and installation and maintenance record*. *Requirement:* Be aware to be at uninterrupted float for 48 hours at least.
2.	Switch the battery circuit breaker to OFF, locate the 2-pin battery connectors Batt1 to Batt4 in the battery compartment and disconnect.

Short-circuit when taking voltage readings

WARNING:

Risk of a short or arcing due to battery cabling without fuse protection.

The battery cabling is not fuse protected for the battery interconnections up to the battery circuit breaker.
A short in this area will cause an destruction by arcing of batteries and cables and thus malfunctioning of the complete ONU.
Use insulated probes for measuring.
Be very careful when taking voltage readings to prevent accidental grounding or shorting of leads during measuring operations. Connections at the meter must be secure and free of any possibility of touching or becoming grounded. Never remove connections at the meter end without first disconnecting the test leads from the battery. Remove test lead connections at the battery immediately after each reading is taken.

3.	Measure the battery voltage for each battery on the 2-pin 14 AWG lead assembly connector and record the battery voltage in the installation record.

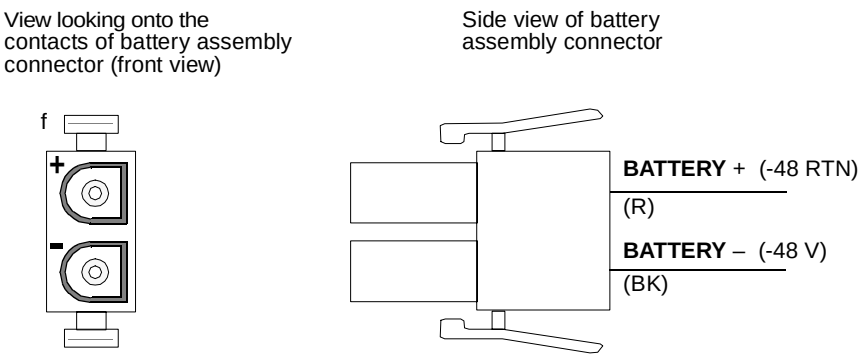

Figure 11-3 Pinning of the 14 AWG lead battery assembly connectors

Because float readings are affected by discharges and recharges, these readings must be taken when the batteries have been on continuous, uninterrupted float for at least one week. For replacing see Chapter 11.4.15, page 11-18.

Comment: **For battery replacement the battery manufacturer specifies the following:** Any fully charged IR-30EC battery at float that reads less than 13 V at 25°C is considered to be shorted and must be replaced[1].

4. Connect the battery connectors Batt1 to Batt4.

5. Switch the battery circuit breaker on the LVD to ON.

11.4.9 Measuring the battery temperature

Battery temperature

The batteries are affected by their ambient temperature. The temperature that has the most direct effect is the battery's internal temperature. All valve-regulated lead-acid batteries use oxygen recombination technology which generates more heat than conventional flooded batteries. Therefore the battery temperature is often higher than the ambient temperature. Always ensure that the thermal probe is correctly inserted between the metallic case and the plastic housing of battery 3. For position of the thermal probe see Figure 7-6, page 7-15.

The batteries can tolerate extreme temperatures (up 65°C) for short, infrequent periods. Nevertheless, make every effort to prevent the battery from being exposed to extreme temperatures.

Elevated battery temperatures

Elevated battery temperatures (greater than 25°C) decrease battery life. Temperatures below 25°C result in lower battery capacity. Applications should allow for battery temperatures within the same string to be within 5.5°C of one another.

The PRU adapts the charging voltage in the range of -5°C to 53°C automatically with -72 mV per 1°C if the battery temperature probe is connected. For adapting the charging voltage see also Figure 2-5, page 2-13.

NOTE:
Operating the IR-30EC battery for any length of time above 25°C (77° F) will result in reduced performance and premature failure. Operation or storage for a significant interval of time above 50°C (122° F) may reduce or void the product warranty.

1 For the IR-30EC batteries it is recommended to replace all 4 batteries if the batteries are older than about 1 to 2 years.

Instruction For measuring the battery temperature proceed as follows:

Step	Procedure
1.	Locate the Installation and Maintenance Record where the battery readings, the installation date and the first readings have already been recorded, see Chapter 7.3.4, page 7-11, *Warranty and installation and maintenance record*.
2.	Use a contact thermometer or connect the temperature probe to the probe tips.
3.	Tape the thermometer to the surface (on the can) of one battery and wait two minutes before reading. For waiting follow the instructions in the manuals for the thermometer/temperature probe. Record the temperature in the installation record.

11.4.10 Cleaning and inspecting

Inspect the batteries and the battery compartment visually as needed or twice a year. If necessary, clean the batteries and the battery compartment using a soft cloth dampened in water. Inspect the delivered battery cable assemblies for corrosion. Report any sign of acid or corrosion to Tyco.

11.4.11 Acid spills and corrosion

In the event of acid spills the battery trays must be cleaned properly. *Only in this case use a wire brush*. Any damaged areas have to be varnished anew.

WARNING: Danger of short circuit.

Clean only the metal battery compartment with a wire brush. Never bring the wire brush close to battery terminals or inter-battery connectors.

11.4.12 Retorquing inter-battery connections

Instruction The inter-battery connections for the delivered battery cable assemblies are factory delivered. Retorquing these connections using an insulated socket and torque wrench set is only required for replacement of the cable assembly.

The battery is equipped with screws for 10-32 x 0.50 thread. Do not use M5 screws.

If retorquing is required retorque IR-30EC batteries with:

40 ±10 inch-pounds (about 4.4 Nm) for IR-30EC batteries.

CAUTION: **Overtightening of the inter-battery connectors could strip the bolt and/or nut threads resulting in loose connections.**

Ensure that all battery connections are tight with the exception of the connection that is being opened.
For retorquing use an insulated torque wrench. Always consider the allowed torque values as specified by the battery manufacturer.

CAUTION: **Danger of explosion.**

An explosion could occur if sparks are created near the battery string.
Check that the batteries are not charging or discharging before loosening or removing battery connections as sparks may occur.
Switch the battery circuit breaker to "OFF".
Use insulated tools and discharge all static electricity from your body before performing any work.
As always, adequate ventilation must be provided.

11.4.13 Discharge capacity test (option)

General

Since the batteries have a lifetime of 5 years at an ambient temperature of 25°C, this test is not required as a routine maintenance procedure. However, a discharge test is the best way to determine if sufficient reserve power is available.

Battery strings to be tested should be on float for at least one month without a power failure exceeding 30 minutes.

NOTE:
The following descriptions are based on the Product Manual for IR-30EC and IR-40EC Batteries. For performing this test follow exactly the instructions in this manual.

CAUTION: **Loss of power due to old and stressed batteries during discharge test.**

Ensure that all batteries have been on float for at least one month without a power failure exceeding 30 minutes.
Always monitor the battery string voltage continuously.
In no case should the string voltage be allowed to drop below 45.6 V for the IR-30EC batteries during the discharge test.

11.4.13.1 General aspects

Testing methods

There are several different methods that can be used in testing the capacity of the string. In general, the more definitive the test, the longer and more difficult it is to perform. For example, measuring individual battery voltages after 15 minutes on a plant load discharge will highlight batteries with only 25% capacity. However, it usually requires a 5-hour, off-line discharge test to spot a 5% fading in capacity.

Test selection

If you decide that a discharge test should be part of the maintenance program, try to carry out the test consistently from site to site and interval to interval. In this way, comparisons and trends can be easily noted. In selecting a test the choices are as follows:

- Single battery or string
- Partial or full discharge
- Constant or variable load.

The easiest test to run is to shut off the AC power and let the plant load discharge the batteries until 20% to 50% of the capacity has been removed. The disadvantage of this type of test is that the current may not be constant throughout the discharge, from interval to interval, or from site to site. This disadvantage can be overcome by adding an external load to the bus. This load can be adjusted throughout the discharge to maintain a constant current.

11.4.13.2 Discharge test

Routine maintenance test

In light of the above, a one-hour discharge similar to the plant load of a single battery string off-line is the preferred routine maintenance test. The one-hour discharge rate to -11.4 V per battery is a reasonable value since it will leave approximately 60% reserve at a lower rate. The resulting string voltage is therefore -45.6 V.

Discharge test

To carry out a discharge test properly, measure and record the time, current, battery voltages and initial battery temperature. The thermometer should be accurate to within 1°C to achieve reasonable accuracy. The current and the time should be measured to an accuracy of 1% and the module voltage measured to the nearest millivolt.

11.4.14 External charging

The Tyco IR-30EC batteries may be charged either by constant potential or constant current chargers.

Boost charging IR-30EC batteries

IMPORTANT:

Water loss due to electrolysis caused by boost charging.

During boost charging water loss is increased and can result in premature failures caused by cell dry-out.
Boost charging the IR-30EC batteries is not recommended without the concurrence of Tyco Technologies. Refer to the Product Manual for IR-30EC and IR-40EC Batteries, Section Operations.

NOTE:
In all cases observe the battery manufacturer's regulations for external charging.

11.4.14.1 Charging voltage for IR-30EC batteries

Constant potential charger for IR-30EC batteries

A potential of **13.5 ±0.06 V** per battery is recommended for an ambient temperature of 25°C for constant potential charging. For details of external charging Tyco IR-30EC batteries see Figure 7-3, page 7-9.

NOTE:
For constant voltage application, failure to reduce the float voltage in systems without temperature compensation may result in premature failure or thermal run-away.

Constant current charger for IR-30EC batteries

For constant current charger the battery manufacturer specifies the following: When batteries are used in plants with a constant current charger, such as Tyco Technologies 337A1, a constant current that results in 13.38 to 14.4 V per battery at ambient temperature of 25°C is recommended for float-standby applications.

Battery cable assembly

The IR-30EC batteries are equipped with cable assemblies and a keyed 2-pin connector. The cable is designed for **15 A** current at maximum.

Short-circuit

WARNING:

Destruction of IR-30EC cable assemblies by improper external charging.

The standard cable assembly mounted on the IR-30EC batteries is designed only for charging currents below 15 A. Charging currents exceeding 18 A will destroy the cable.
If the battery is charged externally in no case should the charging current of the external charger be allowed to exceed 18 A if the delivered cable assembly is used.

NOTE:
For battery replacement the battery manufacturer specifies the following: Any **fully** charged IR-30EC battery **at float** that reads less than 13 V at 25°C is considered to be shorted and must be replaced.

11.4.14.2 Voltage ripple for external charging

AC voltage ripple

The amount of AC voltage ripple present on the charging voltage for the battery can seriously affect battery performance. Excessive ripple could result in sharply reduced battery life and increased gassing rates.

Both the amplitude and frequency of the ripple affect the degree of battery degradation.

As a guideline for IR-30EC batteries, the charging voltage ripple for the battery should not exceed 60 mV peak-to-peak per battery or last longer in duration than 8 ms.

11.4.15 Battery replacement

For battery replacement the battery manufacturer specifies the following:
Any **fully** charged IR-30EC battery **at float** that reads less than 13 V at 25°C is considered to be shorted and must be replaced.

For the IR-30EC batteries it is recommended to replace all 4 batteries if the batteries are older than about 1 to 2 years.

11.5 Appendix for Installation and Maintenance Record

The following two single pages are the copies for the Installation and Maintenance Record from the Product Manual IR Series Batteries (Issue 7, Comcode 107078859).

COPY of the Tyco Product Manual IR-30EC and IR-40EC Batteries (Issue 7, Comcode 107078859)

Installation and Maintenance Record (Page 1)

Company Name: _____ Site Address: _____ Battery Type: ***IR-30EC***

String Voltage: _____ Voltage across charge and discharge buses: _____ Voltage Difference: _____

If the voltage difference between the string and the charge/discharge buses is less than 0.05V, the system is ready. Make individual battery voltage measurements and record in the table below.

Voltage Measurements on Individual Batteries

		Measurement Date										
		Initials										
Battery Number	Serial Number	Order Number										
1												
2												
3												
4												

COPY of the Tyco Product Manual IR-30EC and IR-40EC Batteries (Issue 7, Comcode 107078859)

Installation and Maintenance Record (Page 2)

Company Name: _____ Site Address: _____ Battery Type: ***IR-30EC***

Temperature Measurements on Selected Batteries

	Measurement Date										
Battery Number	Initials										
1											
2											
3											
4											

String Float Current Measurements

	Measurement Date										
Battery Number	Initials										
1											
2											
3											
4											

Battery Capacity Measurements

Test Date	Battery Temperature	Start Voltage (Vdc)	End Voltage (Vdc)	Test Current (A)	Test Start Time	Test End Time	Percent Capacity

Product support

A

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A.2 Training A-1

A.3 Engineering and installation services A-2

A.4 Customer assistance requests entry system (CARES) A-3

Contents

Product support

A

A.1 Overview

Purpose

This section provides the training and product support services associated with the *AnyMedia*® Access System.

A.2 Training

How to get information

Consult your local Lucent Technologies Account Executive for more information.

Courses

The following training courses for the *AnyMedia* Access System are available:

Table 1 Training courses

Course Title	Course Number
AnyMedia Access System Overview	TR5811
AnyMedia Access System Operations and Maintenance for Narrowband Services	TR5812
AnyMedia Element Manager Operations and Maintenance for Narrowband Services	TR5813
AnyMedia Access System Operations and Maintenance for Broadband Services	TR5814
AnyMedia Element Manager Operations and Maintenance for Broadband Services	TR5815
AnyMedia Access System Upgrade to Release 1.4	In preparation

Table 1 Training courses

Course Title	Course Number
AnyMedia Element Manager Release 1.7 Operations and Maintenance for Narrowband and Broadband Services	In preparation
Cabinet power system (CPS) 2000	PWR3003-I/M
WaveStar ADM 4/1	TR5881

A.3 Engineering and installation services

Overview

The Lucent Technologies Customer Operations and Program Management (COPM) organization is committed to providing customers with quality product support services. Whether you need assistance in engineering, installation, normal system maintenance, or disaster recovery, the support staff provides the quality technical support you need to get your job done. Each segment of the COPM organization regards the customer as their highest priority and understands your obligation to maintain quality service for your customer.

Please contact your local Account Executive for more information on these services.

Engineering and installation services group

Within the COPM organization, the Engineering and Installation Services group provides a highly skilled force of support personnel to provide customers with quality engineering and installation services. These engineering and installation specialists use state-of-the-art technology, equipment, and procedures to provide customers with highly competent, rapid response services. These services include analyzing your equipment request, preparing a detailed specification for installation, creating and maintaining job records, installing the equipment, and testing and turning over a working system.

The Engineering and Installation Services group provides the customer with an individually tailored, quality-tested job that meets our published high standards and the customer's operational requirements. The group ensures that the customer's system order is integrated into a complete working system tailored to office conditions and preferences. It includes provision for cabling, lighting, power equipment, and ancillary connections to local and/or remote alarm systems. The group responds to any customer changes that occur during installation.

Testing

Equipment engineered and installed by Lucent Technologies is thoroughly tested and integrated into a reliable system at cut-over. Once approved by Lucent Technologies' Quality Assurance Test group, the system is turned over to your company.

The Quality and Assurance Test Group also provides any specialized engineering and installation services required for unusual or highly individualized applications. These specialized services may include engineering consultations and database

preparation. Your local Account Executive can provide more information about these services.

A.4 Customer assistance requests entry system (CARES)

Introduction

The customer assistance requests entry system (CARES) software tool is designed to assist Lucent Technologies in providing quality service to our customers for a variety of products. Customers can use the tool to communicate with the technical support groups. Support groups use CARES to track action requests (ARs) and keep them up-to-date.

Action request forms may be obtained from

- Designated local area coordinators
- Lucent Technologies account representatives.

Login requests may also be handled by the technical support groups.

CARES applications

The CARES tool allows customers to process action request information. The CARES application is the customer's primary interface to Lucent Technologies' support structure. Using this application, users input their varied assistance requests, including, but not limited to:

- Product problems
- Engineering complaints
- Procedural assistance
- Installation assistance
- Dispatching.

The following assignment is to be considered in order to guarantee that the ARs are sent to the correct assignee:

ARs related to	Assigned Group
AnyMedia Access System	Germany SAS Customer Technical Support
AnyMedia Element Manager (NB&BB)	SAS R&D ACCESS Spain

Support labs

For technical support, call the Local Customer Support (LCS) of Lucent Technologies. If no LCS is available call the Lucent Technologies Customer Technical Support (CTS) organization at

Phone +49-911-526-3849 or
FAX +49-911-526-4120

The Lucent Technologies Customer Technical Support (CTS) organization has the Customer Advocate System Test Lab (CASTL) in place to aid in support of the customer. The various functions performed in the support lab are as follows:

- Duplication of customer-reported problems to assist in problem resolution
- Service restoration of equipment
- Systems test
- Customer demonstrations
- Ensuring field-grade quality software
- Certifying product changes
- Failure mode analysis
- Providing customized training for customer and support teams
- Developing installation procedures
- Developing modification procedures
- Initial customer laboratory evaluations (ICLEs).

Abbreviations and acronyms

Symbols

-48A / -48B
Negative Internal Voltage of the -48 V Power Feeder inside of the ONU Subshelf (1st / 2nd Feeder)

-48
Common Internal Voltage of the -48 V inside the ONU Subshelf

-48RTN
Return Potential of the -48 V Power Feeder inside of the ONU Subshelf (1st / 2nd Feeder)

-48VA / -48VB
Negative Voltage of the External -48 V Power Feeder (1st / 2nd Feeder)

-48VBAT
Negative Voltage of the Battery String

7A
Fan Unit of the ONU for Indoor Applications

Numerics

2B1Q
2 binary, 1 quaternary

3Com
3Com Corporation

4B3T
4 binary, 3 ternary

52C
Outdoor Electronics Cabinet

92C
International Indoor Electronics Cabinet

A

a/b-Cable
Cable for 32 Subscriber Lines (with two wires each), also called T/R cable, VF cable

a/b
Two Copper Wires for Subscriber Lines (the same as Tip/Ring)

AC
Alternating Current

ACF
Alternating Current Input Power Failure

ADSL
Asymmetrical Digital Subscriber Line

ADSL4 AP/ADSL4p AP
Asymmetrical Digital Subscriber Line AP with 4 ADSL Ports and 8 splitters for POTS Ports

ADSL4i AP
Asymmetrical Digital Subscriber Line AP with 4 ADSL Ports and 4 splitters for ISDN Ports

ADSL8 AP/ADSL8p AP
Asymmetrical Digital Subscriber Line AP with 8 ADSL Ports and 8 splitters for POTS Ports

ADSL16i AP
Asymmetrical Digital Subscriber Line AP with 16 ADSL Ports and 16 splitters for ISDN Ports

ADSL16p AP
Asymmetrical Digital Subscriber Line AP with 16 ADSL Ports and 16 splitters for POTS Ports

AFM
ATM Feeder Multiplexer

AFME1
ATM Feeder Multiplexer for E1

AFM_E3
ATM Feeder Multiplexer (34 Mbit/s)

AFMDS3
ATM Feeder Multiplexer (45 Mbit/s)

AFMO
Optical ATM Feeder Multiplexer

ALL
Analog Leased Line

ALMMSG
Alarm Message

ALMTYPE
Alarm Type

ALS
Automatic Laser Shutdown

AP
Application Pack

APOG
Applications, Planning, and Ordering Guide

AR
Action Request

ASCII
American Standard Code for Information Interchange

ATM
Asynchronous Transfer Mode

AWG
American Wire Gauge

B

BD
Battery on Discharge

BNC
Bayonet Navy Connector (coaxial connector used for DS3/E3 AFM side)

BRA
Basic Rate Access

BRDG
Bridge

C

C
Centre Contact, Common (Relay Contact)

C&P
Commands and Procedures

CARES
Customer Assistance Requests Entry System

CASTL
Customer Advocate System Test Lab

CCN
Customer Change Notice

CD
Carrier Detect

CD-ROM
Compact Disk Read Only Memory

CE
Communauté Européenne

CHAN/MON
Channel Testing and Monitoring (switch side)

CIT
Craft Interface Terminal

CIU
Communication Interface Unit

CLE
Customer Laboratory Evaluations

CLF
Carrier Line Failure

CLEI
Common Language Equipment Identifier

CMM
Command and Message Manual

CO
Central Office

Comcode
Unique Nine-digit Ordering Code Used by Various Lucent Organizations

COM1 (COM2)
Communication Port 1 (Communication Port 2)

COM500
Apparatus Code for the COMDAC (old version)

COM501
Apparatus Code for the COMDAC (new version)

COMDAC
Common Data and Control

COPM
Customer Operations and Program Management

CPE
Customer Premises Equipment

CPF500
Apparatus Code for the Optical Controller Pack

CR
Critical (Alarm)

CRC
Cyclic Redundancy Check

CTS
Clear To Send

CTS
Customer Technical Support

D

DBx
D-sub Connector with x Pins

DC
Direct Current

DCD
Data Carrier Detect

DCE
Data Communication Equipment

DDF
Digital Distribution Frame

DIN
Deutsches Institut für Normung (German equivalent to ANSI)

DIP
Dual-in line Package

DLL
Digital Leased Line

DMM
Digital Multimeter

DROP
Subscriber Line/Equipment

DS3
Digital Signal Level 3 (45 Mbit/s)

DSL
Digital Subscriber Line

DSR
Data Set Ready

DTE
Data Terminal Equipment

DTP500
Apparatus Code for the CIU

DTR
Data Terminal Ready

DynaMiTe chip set
ADSL chip set of Alcatel for interfacing ADSL to LAN, USB, PCI, ...

E

ECI
Equipment Catalog Item

EM
Element Manager

EMC
Electromagnetic Compatibility

EMS
Navis AnyMedia Element Management System (SW)

EN
European Norm

EQ
Equipment (*AnyMedia*: subscriber side including AP cable)

ESD
Electrostatic Discharge

ETENV
Environmental Alarm Input

ETR
ETSI Technical Report

ETS
European Telecommunication Standard

ETSI
European Telecommunication Standards Institute

F

F_AL
Fan Alarm (Fan unit)

FAC
Facility (*AnyMedia*: switch side including AP)

FAC500
Apparatus Code for the I/O_E1 Pack (old version)

FAC500B
Apparatus Code for the I/O_E1 Pack for V5/V3

FAULT
Failure (Alarm and LED on APs)

FC
Fiber Connector for OCP and OAP

FCC
Federal Communication Commision

FDA/CDRH
Food and Drug Administration's Center for Devices and Radiological Health

FDI
Feeder Distribution Interface

FLT
Fault

FRMGND
Frameground

FSA
First Service Application

FU
Fan Unit

G

GA
General Availability

GDT
Gas Discharge Tube

GMT
Special Fuse Type

GND
Signal Ground

GPB
General Purpose Bus

GSI
Graphical System Interface (Software)

GUI
Graphical User Interface

H

H1
Inventory Header of the *AnyMedia* Shelf

HDB3
High Density Bipolar of Order 3 Code

HDLC
High Level Data Link Control

HDSL
High bit-rate Digital Subscriber Line (for *AnyMedia:* two pair system)

HDSL AP
Application Pack for High bit-rate Digital Subscriber Lines

HDSL Link
HDSL Service (without respect of numbers of copper pairs used)

HDSL Pair
Copper pair used for HDSL Transmission (without respect of Service)

HW
Hardware

I

IC
Integrated Circuit

ICC
Interchangeability Code

ICLE
Initial Customer Laboratory Evaluation

ID
Identification

IDC500
Apparatus Code of one IO_HDLC Pack (old version)

IDC500B
Apparatus Code of one IO_HDLC Pack (new version)

IEC
International Electrotechnical Commission

IEEE
Institute of Electrical and Electronic Engineers

IM
Installation Manual

INR
International Region/Market

IS
In Service

ITU
International Telecommunication Union

ITU-T
International Telecommunication Union Standardization

IO_E1
Quad E1 Interface Pack

IO_HDLC
HDLC Pack

IP
Internet Protocol

IR-30EC
Battery 12 V, 25 Ah

ISDN
Integrated Services Digital Network

L

L1 / L2
Phase of the AC Mains

LAN
Local Area Network

LCS
Local Customer Support

LE
Local Exchange

LED
Light Emitting Diode

LH
Long Haul

LL
Leased Line

LPA400/LPA400B
Apparatus Code of one ADSL AP with 4 ADSL-interfaces and 4 Splitters for Z Ports, no G.-lite

LPA400B
Apparatus Code of one ADSL AP with 4 ADSL-interfaces and 4 Splitters for Z Ports

LPA408
Apparatus Code of one ADSL AP with 8 ADSL-interfaces and 8 Splitters for Z Ports

LPA414
Apparatus Code of one ADSL AP with 4 ADSL-interfaces and 4 Splitters for ISDN Ports

LPA416
Apparatus Code of one ADSL AP with 16 ADSL-interfaces and 16 Splitters for Z Ports

LPA417
Apparatus Code of one ADSL AP with 16 ADSL-interfaces and 16 Splitters for ISDN Ports

LPA419
Apparatus Code of one ADSL AP with 16 ADSL-interfaces and 16 Splitters for ISDN Ports with Low Resistance Test Path

LPA900
Apparatus Code of one AFMDS3 AP with DS3-interfaces (No Duplex Operation)

LPA901
Apparatus Code of one AFMDS3 AP with DS3-interfaces for Duplex Operation

LPA910
Apparatus Code of one AFM_E3 AP with E3-interfaces (No Duplex Operation)

LPA911
Apparatus Code of one AFM_E3 AP with E3-interfaces for Duplex Operation

LPA920
Apparatus Code of one Optical AFM AP with STM1-interface

LPA941
Apparatus Code of one AFME1 AP with E1-interface

LPF500
Apparatus Code for the Optical Application Pack (in the *AnyMedia* Mainshelf)

LPP100B
Apparatus Code of one POTS AP with 24 Z-interfaces

LPS501
Apparatus Code of one HDSL AP with 4 HDSL Ports or ISDN-PRA or Nx64k for V5

LPS503
Apparatus Code of one HDSL AP with 4 HDSL Ports or ISDN-PRA or Nx64k for V5/V3

LPS504
Apparatus Code of one HDSL AP with 4 HDSL Ports or ISDN-PRA or Nx64k for V5/V3 and E1

LPS510
Apparatus Code of one SHDSL AP with 8 SHDSL Ports and 4 E1 Ports

LPS716
Apparatus Code of one SDSL AP with 16 SDSL Ports

LPU112
Apparatus Code of one ISDN AP with 12 U Ports (2B1Q coding)

LPU430
Apparatus Code of one ISDN AP with 16 U Ports (4B3T coding)

LPZ100B
Apparatus Code of one POTS AP with 32 Z-interfaces

LPZ120/121/122B
Apparatus Code of one POTS AP with 32 Z-interfaces (country specific POTS AP without TAP capability, also ZEUS card called)

LTU
Line Termination Unit

LVD MOSFET
Low Voltage Disconnect Unit and Internal MOSFET-Device Inside the LVD500)

LVD500
Apparatus Code for the Low Voltage Disconnect Unit

M

MARGIN
Adjustment Switch on the Power Rectifier Unit to Adapt the Charging Voltage

MDF
Main Distribution Frame

mesh-BN
Meshed Bonding Network

mesh-IBN
Meshed Isolated Bonding Network

MIDPOINT
Middle Wire of the of the 3-pin Battery String Cable for Battery Balance Supervision

MISC
Miscellaneous (alarms)

MJ
Major (Alarm)

MJF
Major Fuse Alarm

MM
Mechanical Ground

MN
Minor (Alarm)

Modem
Modulator/Demodulator

MON
Monitor

MOV
Metal Oxide Varistor

MPT
Mass Provisioning Tool

MPT-USM
Mass Provisioning Tool for V5 Services User Manual

MPT-V5
Mass Provisioning Tool for V5 Services

MSP
Multiplex Section Protection

N

N
Neutral Wire of the AC Mains

N.A.
Not accessible

NAR
North American Region/Market

NE
Network Element

N.C.
Not Connected (Wire)

NC
Normally Connected (Relay Contact Break)

NO
Normally Open (Relay Contact Make)

NRZ
Non Return to Zero

NSA
Non-Service Affecting

NTU
Network Termination Unit

N(x)Test
Remote test Head (device)

O

OAM&P
Operations, Administration, Maintenance, and Provisioning

OAP
Optical Application Pack (in the *AnyMedia* Mainshelf)

OCP
Optical Controller Pack for the ONU (in the ONU Subshelf)

OI No.
Orderable Item Number

OMC
Operation and Maintenance Center

QMS
Quality Management System

OOS
Out Of Service

P

PC
Personal Computer

PC GSI
Personal Computer for Graphical System Interface

PCI
Peripheral Component Interconnect

PDF
Portable Document Format (Acrobat Reader File Extension / File Characterization)

PDH
Plesiochronous Digital Hierarchy

PE
Protective Earth

PFU
Power Filter Unit

PFU500/PFU501
Apparatus Code for the Power Filter Unit

PFU BYPASS
Bridge on the Backplane of the ONU Subshelf for Internal Powering via the PRU (factory setting)

PLL
Permanent Leased Line

PM
Performance Management

PMJ
Power Major Alarm

PMN
Power Minor Alarm

POTS
Plain Old Telephone Service

ppm
parts per million

PPM
Periodic Pulse Metering

PPP
Point-to-Point Protocol

PRA
Primary Rate Access

PRC
Product Realization Center

prETS
Preliminary European Telecommunication Standard

PRU
Power Rectifier Unit

PSTN
Public Switched Telephone Network

Q

QMS
Quality Management System

QOS
Quality of Service

R

RADSL
Rate Adaptive Digital Subscriber Line

RD
Receive Data

REN
Ringer Equivalent Number

RGU
Ringing Generator Unit

RI
Ring Indicate

RING INT
Bridge on the Backplane of the ONU Subshelf for Internal Ringing via the RGU (factory setting)

RING EXT
Bridge on the Backplane of the ONU Subshelf for External Ringing via Connector E1 RING

RJ11
Modular 6-pin Plug Connector (e.g. from AMP)

RJ45
Modular 8-pin Plug Connector (e.g. from AMP, also called Western connector)

RMC
Remote Maintenance Channel

ROC
Remote Operations Channel

RS-232C
Serial Interface

RRG
Ring Wire of the Ringing Voltage

RRG0
Ring Wire of the Ringing Voltage Input of the *AnyMedia* Shelf

RRGE
Ring Wire of the External Ringing Voltage

RRGI
Ring Wire of the Internal Ringing Voltage (from the RGU)

RS540
Apparatus Code for the Power Rectifier Unit 540 W

RTNBAT
Positive Voltage of the Battery String

RTS
Request to Send

RTU
Right-to-Use (License)

RxD
Receive Data

S

SAS
Switching and Access Solutions

SC
Type of Keyed Fiber Connector in Plastic Housing with Snap-in

SDH
Synchronous Digital Hierarchy

SELV
Safety Extra-Low Voltage

SH
Short Haul

SN
Serial Number

SNMP
Simple Network Management Protocol

STENV
Environmental Alarm Output

STM
Synchronous Transport Module

STM-1
Synchronous Transport Module Level 1 (155.52 Mbit/s)

STM-4
Synchronous Transport Module Level 4 (622.08 Mbit/s)

SVC
Service Channel

SVGA
Super Video Graphics Adapter

SW
Software

T

T/R
Tip/Ring Wire (the same as a/b Wire)

T/R Cable
Cable for 32 Subscriber Lines (with two wires each, the same as a/b-cable), also called VF cable

TAMPER
52C Cabinet Alarm: Intrusion or cabinet door open

TAP
Test Access Path

TAP100
Apparatus Code for the Test Application Pack

TAP-B
Test Access Path B

TC
TAP Connected

TCP/IP
Transmission Control Protocol/Internet Protocol

TD
Transmit Data

TDM
Time Division Multiplexing

TE
Terminal Equipment

TELNET
Telephone Network

TL1
Transaction Language 1

TLM
Alarm Input

TRG0
Ring Return Wire, Tip Wire of the Ringing Voltage Input of the *AnyMedia* Shelf (Grounded)

TS
Timeslot

TSI
Timeslot Interchange

TxD
Transmit Data

U

UAWG
Universal ADSL Working Group

UART
Universal Asynchronous Receiver/Transmitter

UDSL
Universal ADSL = G.Lite (ITU G.992.2 = 1.5 Mbit/s downstream/128 kbit/s upstream

UPN
Urgent Problem Notification

USM
User Service Manual

V

V.11
Serial Interface

V.24
Serial Interface

V.28
Serial Interface

VDE
Verband Deutscher Elektrotechniker e.V. (German equivalent to IEEE)

VF
Voice Frequency

VF Cable
Cable for 32 Subscriber Lines (with two wires each, the same as a/b-cable), also called T/R cable

VRLA
Valve Regulated Lead Acid (battery type)

W

Win95
PC Operating System "Windows 95" (Microsoft)

WDM
Wavelength Division Multiplexing

X

XOFF
Transmit Off

XON
Transmit On

XON/XOFF
Software Handshake Protocol for Serial Interface

Z

Z Port
2-wire Analog Subscriber Port

Z Interface
2-wire Analog Subscriber Port

Z-Cable
Cable for 32 Subscriber Lines (with two wires each, the same as a/b-cable)

ZEUS AP
Synonym for POTS AP with 32 Z-interfaces (country specific POTS AP without TAP capability, see LPZ12xB)

Glossary

0dBr-Point
0dBr-Point is a defined digital reference point. This point is located on the digital signal side in a local exchange (LE).

1N / 3N
Formats of packs which define the height according to the OneGPN standard hardware requirement. 1N is 96 mm high, 3N is 336 mm high.

A

a-wire
One of the two wires of an a/b copper pair. The a/b copper pairs are used for subscriber lines connected with e.g. Z interfaces, U interfaces, HDSL interfaces or ADSL interfaces. The a-wire is sometimes called tip-wire.

a/b-Cable
Copper cable for 32 Subscribers with two wires each (copper pair consisting of the a-wire and the b-wire). The cable is connected to the APs. Sometimes the a/b-cable is also called: Voice frequency (VF) cable or the T/R cable (Tip/Ring cable).

ADSL subscriber
Asymmetric Digital Subscriber Line - An ADSL line carries POTS/ISDN and broadband data.

AEM
AnyMedia Element Manager - Represents computing facilities, specialized software and data storage facilities used to administer and maintain multiple network elements (NEs) distributed over a wide geographical area from a centralized location. Communication in both directions is accomplished via TL1 messages.

AID
Access Identifier - AID is the address within a TL1 command that is used to identify the physical or logical entity (or entities) within a network element to which the command applies. It has the format of a unique component identifier followed by hierarchical addresses of components. For example, e1-{1}-{2}-{4} is an object representing E1#4 on IO_E1 pack #2 in the *AnyMedia* Mainshelf #1.

ALL
Analog Leased Line - Service using a 2-wire Z interface for analog subscriber terminals without out-band signaling and without DC feeding (normally for uses other than telephony, e.g. data transmission).

ANE
Access Network Element - An access network element is a system, implemented between the service node (e.g. local exchange (LE) and the user, replacing part or all of the local line distribution network.

***AnyMedia* Access System**
The *AnyMedia* Access System is an access network element which supports various narrowband and broadband services, digital as well as analog.

***AnyMedia* Mainshelf**
The *AnyMedia* Mainshelf is a metal construction that serves to guide and fasten packs, locate and mount a multilayer backplane. It allows mounting into supporting structures such as racks, and provides an interface for internal and external connections. One shelf houses up to 16 E1 feeders and up to 16 subscriber distribution application packs.

AP
Application Pack - A 3N-seized pack which is located in any of the AP slots of the *AnyMedia* Access System. APs are for example LPZ100, LPU112, TAP100 as well as ADSL and AFM packs for broadband applications.

Apparatus code
The apparatus code is an 8-byte item of ASCII information stored in the nonvolatile data storage (NVDS) of a pack (e.g. LPZ100, DTP500,...). It is a unique identifier which specifies the function of the pack.

AUXID
Auxiliary ID Code - The AUXID helps to distinguish packs that have identical main ID codes. The AUXID is of 2 characters in length. Currently not used in the *AnyMedia* Access System.

B

b-wire
One of the two wires of an a/b copper pair. The a/b copper pairs are used for subscriber lines connected with e.g. Z interfaces, U interfaces, HDSL interfaces or ADSL interfaces. The b-wire is sometimes called ring-wire.

Battery backup
In addition to a power plant a battery pack is supplied to provide a power backup in cases of AC power failures.

BIST
Built-in Self-Test - The BIST is a procedure executed by a pack either after power-up or on demand. The task is to check the functions of the hardware.

Bit error ratio
The quality of transmission is measured in the number of errored bits per number of bits received.

BORSCHT
BORSCHT is an abbreviation for interface functions provided by Z ports for POTS.

- Battery (Subscriber loop feeding)
- Overvoltage/Overcurrent protection
- Ringing (Ringing signal provided for subscriber's terminal)
- Supervision (Loop signaling)
- Coding/Decoding (PCM)
- Hybrid (2-to 4-wire conversion)
- Test (provide a test access to subscriber's line and line circuit)

Bridge
A network layer device that passes packets between two or more network segments that use the same data link communications protocol (OSI layer 2). The network segments appear as one segment to protocol levels higher than the data link layer.

C

Centralized powering
The *AnyMedia* Access System is powered by a central DC power plant. This power plant normally feeds other telecommunication equipment as well.

Circuit
See port.

Circuit testing
Verifies the ability of an AP port to provide proper transmission and signaling. The actual circuit tests needed depend on the particular service being provided; i.e., POTS and ISDN need different circuit tests. In the *AnyMedia* Access System only the self-test capability of the AP is used. (See also drop testing.)

CIT
Craft Interface Terminal - The Craft Interface Terminal is a dumb terminal, used to enter and receive TL1 (Transaction Language 1) messages in ASCII format. A CIT emulation is running on the GSI.

CIT interface
Interface for the Craft Interface Terminal - A serial RS-232C interface (9-pin Dsub) on the faceplate of the communication interface unit (CIU) where a craft interface terminal (CIT) or a graphical system interface (GSI) is connected to the *AnyMedia* Access System.

CIU
Communication Interface Unit - This pack is used to provide several OAM&P interface terminations to the *AnyMedia* Access System.

CLEI
Common Language Equipment ID code - The CLEI is a 10-character code assigned by Bellcore identifying each pack. The CLEI information relates to the function of the pack, the condition of use, the source document used in creating the CLEI code, etc. If two packs have the same first seven characters in the CLEI code, then the packs are electrically and mechanically interchangeable. Knowledge of the CLEI is useful in planning, engineering and provisioning.

Comcode
The comcode is a unique nine-digit code with the ECI being represented by the digits 2 through 7. The comcode is used by various Lucent organizations for the ordering of components.

COMDAC
Common Data and Control - Pack which provides the central control and transmission fabric for the *AnyMedia* Access System. The COMDAC supports multiple system applications, including V5.x switched services and analog and digital leased lines (ALL and DLL) and a variety of application packs.

CPE
Customer Premises Equipment - CPE covers the subscriber's installation and the subscriber's terminal.

CRC-4 procedure
Cyclic Redundancy Check-4 - A multiplication/division process, specified in ITU-T G.704. It offers additional protection against simulation of the frame alignment signal and provides a capability for enhanced error monitoring.

Customer-specific
Reflects the particular configuration needs of a customer. Customer-specific configuration of the system is achieved by constant data which is part of the code. E.g. customer-specific application pack data or PSTN protocol data belong to this kind of configuration data. Colloquially customer-specific is sometimes called country-specific.

D

Default configuration
The configuration that is achieved by initially programming the COMDAC's nonvolatile data storage (NVDS). With a "default configuration" the system should be able to recover with default values in the system database.

Defaults
Defaults are the parameter values built into the *AnyMedia* Access System when it is shipped from the factory. The sum of all defaults forms the default configuration. (Default values are restored upon execution of an Initialize-System command.) For TL1 commands there are defined defaults for parameter values which are used for parameters not given in the command line.

Digital local line
A metallic local line that is able to simultaneously carry bidirectional digital transmission providing ISDN-BRA subscribers and leased-line subscribers, between LT and NT1.

DLL
Digital Leased Line - Used for point to point connections. The DLL bypasses the LE.

Downstream
The bit stream direction from the network towards the NT or the customer.

Downstream Direction
Transmission direction from ATM data network or telephony switch to customer.

Drop
See subscriber loop.

Drop testing
Checks for open circuits, shorts, leakages to ground, foreign voltages, or other faults on the subscriber loop.

DSL
Digital Subscriber Line - Provides full duplex service on one or two metallic pairs at bit rate which are capable of supporting ISDN BRA, ISDN PRA, DLL or n × 64 kbit/s digital leased lines and additional framing, timing recovery and operations and maintenance functions.

Duplex mode
Two COMDACs are equipped in the *AnyMedia* Access System. One COMDAC is active and controls the whole system, the other is in stand-by mode. During operation the memories (NVPS, NVDS and RAM) of both are mutually consistent. One reason to perform a side switch is if the active COMDAC fails. In this case the COMDAC previously in stand-by mode is now active.

E

E1
E1 is the standard acronym for the 2.048-Mbit/s interface defined in the ITU-T Recommendations G.703/G.704.

E1 feeder
E1 link between the *AnyMedia* Access System and a service node.

ECI
Equipment Catalog Item - the equipment catalog item code is a 6-character code assigned by Bellcore identifying each pack. This code corresponds to the bar-coded label on the faceplate of the pack, and is uniquely equivalent to the CLEI code - for a given CLEI there is a unique ECI. It is used internally in the databases of external inventory systems for cataloging equipment and is useful in accounting and inventory control.

EIDR
Enhanced Inventory Data Record - the enhanced inventory data record is a set of parameters that are stored in the nonvolatile memory of packs. The parameters relate to the function performed by the pack, the manufacturing information, ordering information etc. that is of importance in provisioning a new service, maintaining the service, and in restoring the service quickly in the event of a failure.

Engineering work order
In order to build up a system on site or to grow or degrow a running system, an engineering work order is necessary. By means of this order, the installation group can plan and carry out the construction. The engineering work order is done away from the site by the installation group in cooperation with the customer. The engineering work order contains e.g. floor plan data sheet, application schematic, interconnections.

Equipment pair
The equipment pair of the TAP-B interface consists of the 2 wires towards the customer premises equipment (outward direction).

F

Facility pair
The facility pair of the TAP-B interface consists of the 2 wires towards the application pack circuitry (inward direction).

Far end
Any other network element residing in the network complex away from the *AnyMedia* Access System (i.e. the location of the service node is at the opposite end of the feeder E1 for the reported failure).

Feature packaging
Customization mechanism where a subset of the overall set of software packages is selected and incorporated in a load image to support a certain functionality (e.g. POTS-only, ISDN-only, V5.2-only). Feature packaging allows the setting of the functionality requested by a customer separately as opposed to the complete functionality the system can provide.

Function code
The function code (sometimes called entity type) is the 'pet name' of a pack. It is a set of 11 characters stored in the nonvolatile data storage (NVDS) of a pack and identifies a pack, backplane, or a software package (e.g. COMDAC, CIU,...).

G

GPB
General Purpose Bus - The general purpose bus is an *AnyMedia* Access System internal 12-wire connection between any of the APs in the *AnyMedia* Mainshelf and the CIU. Each AP can connect any of its circuits to the GPB via relays. The GPB is situated on the backplane of the *AnyMedia* Mainshelf.

GSI
Graphical System Interface - A user-friendly front-end for communicating with a system. In the *AnyMedia* Access System the GSI is installed on a Windows 95 personal computer and used for entering and receiving TL1 (Transaction Language 1) messages. The GSI provides support for managing the *AnyMedia* Access System in the following functional areas:

- Configuration management
- Fault management
- Performance management
- Security management
- Inventory management.

H

HDSL AP
High Bit Rate Digital Subscriber Line Application Pack - An application pack containing HDSL ports that provide service to ISDN PRA subscribers and n $\times$ 64 kbit/s digital leased lines subscribers.

HDSL application mode

The mode in which an HDSL module operates. Several application modes are provisionable:

- Single pair mode:
  Only one HDSL port (pair) is used. 17 HDSL logical timeslots are provided including timeslot 0 and 16. Only one NTU is connected.
- Point-to-point mode:
  Two HDSL ports (pairs) are used in parallel. 32 HDSL logical timeslots are provided including timeslot 0 and 16, but timeslot 16 normally is reserved for use by G.703 (PRA or leased lines) services. Only when more than 30 timeslots are provisioned, HDSL logical timeslot 16 can also be used by other services, e.g. V.35. Only one NTU is connected.
- Point-to-multipoint mode:
  Two HDSL ports (pairs) are used but are connected to two different NTUs. 32 HDSL logical timeslots are provided, but only 2×15 bearer channels are available. Timeslot 0 is excluded and timeslot 16 is reserved for the D64 signalling channel for ISDN PRA service provisioned on HDSL port 1 (no ISDN PRA service possible when PairGain firmware version V3.20.00 is used). HDSL logical timeslots are mapped as provisioned one by one to the user timeslots at the NTUs.

HDSL pair

Physical connection between a line termination unit (LTU) and a network termination unit (NTU) via one copper pair. It provides duplex transmission on 2-wire metallic local lines with a transmission rate of 1×1168 kbit/s.

HDSL port

Refers to the devices and functions built on or provided by an HDSL AP to support HDSL transmission. Each HDSL port refers to one HDSL pair. Two HDSL ports are mounted on one HDSL interface to enable a transmission rate of 2×1168 kbit/s.

High-impedance state

This state refers to the Z interface and implies that the physical Z port circuit is disabled. Consequently no feeding current can flow from the Z interface to the subscriber's terminal, no loop scanning will be performed and no AC signal transmission is possible.
This state also refers to the clock termination on the CIU if clock distribution is supported for the DC-powered rack. If the CIU is jumpered for high-impedance the clock termination is done from outside via the dummy load connector on the clock distribution panel.

Hook flash

Hook flash is a signal of POTS. A hook-flash signal is a short interruption of the subscriber's loop, which is generated at the subscriber's terminal. Hook-flash signals are used to request additional service features (e.g. establishing a three party telephone conference).

I

ICC

Inter Changeability Code - The ICC is of the form Sm:n, where "m" is the issue number and "n" is the series number. This is used to accurately indicate the interchangeability among packs with the same pack name and apparatus code, but different manufacturing versions. In general, a pack can be replaced by another pack that has the same apparatus code and the same issue number regardless of the series number. Because Transaction Language 1 (TL1) uses the ":" as a delimiter, for inventory retrieval using TL1 the ":" is replaced with a "-". For example, an ICC will appear as S1:1 on a pack and will appear as S1-1 when retrieved using a TL1 command.

In-band signaling

The transfer of signaling data inside the same frequency band with a defined bandwidth as used for voice or voice-grade data transmission. The bandwidth for analog subscriber services is defined as being between 300 Hz and 3400 Hz.

Initial mass provisioning
The mass provisioning of an empty system.

Initial ring
The initial ring is sent from the LE to the *AnyMedia* Access System. It indicates that the LE wants to transfer CLIP information in the a/b path to the CPE.

Inrush current
The inrush current is the current flowing at the moment when the power is switched on.

Inventory
The inventory is the summary of data stored on a pack in the NVDS during manufacturing which is used to identify the pack and its functionality.

IO_E1
Quad E1 Interface Unit - This is a pack which terminates four E1 signals.

IO_E1P
Quad E1 Interface Unit Protection - This is an IO_E1 pack used as a protection unit.

IO_HDLC
High level data link control pack - The pack which performs the frame relaying function necessary for ISDN subscribers. Additionally internal frame relaying for V5 layer 3 messages is performed.

ISDN subscriber
ISDN-BRA - Integrated Services Digital Network Basic Rate Access - An ISDN PRA subscriber has the transmission capability of up to 30 B channels (30 × 64 kbit/s) and one D-channel (64 kbit/s) and can only be connected to a V5.2 interface.

ISDN-U AP
Integrated Services Digital Network Application Pack with U Interface - A pack containing 2B1Q U ports that provide service to ISDN-BRA subscribers and leased-line subscribers.

ISDN AP
Integrated Services Digital Network Application Pack - A pack containing 2B1Q or 4B3T U ports that provide service to ISDN BRA subscribers and leased lines subscribers

ISDN-BRA
The requested bandwidth at the V5 network interface is two bearer channels plus a frame relay over a communication channel for the 16-kbit/s signaling channel (that is a 2 × 64-kbit/s bearer channel connection plus a 16-kbit/s D-channel). The following type of ISDN-BRA subscriber is implemented in the *AnyMedia* Access System:
NT1 outside the *AnyMedia* Access System at the CPE.

ISDN user port
Delivers digital telephony and data services to an ISDN subscriber. It is addressed by a logical 13-bit address (envelope function address) used in the relevant protocols on the V5.x interface. With respect to the V5.x interface the envelope function address uniquely identifies one ISDN user port.

J

Jitter
Short-term noncumulative variations of the significant instants of a digital signal from their ideal positions in time. The most significant form of jitter arises from imperfections in the circuitry, e.g. quantizing distortions in phase locked loops (PLL).

L

LE
Local Exchange

Link
In the V5 context a 2.048-Mbit/s interface to the local exchange whose physical and electrical characteristic comply with ITU-T Recommendation G.703 and whose functional characteristics are according to ITU-T G.704 and G.706.

LL
Leased Line - A permanent connection between a user port and a separate permanent leased-line service network. Leased lines bypass the LE.

Local powering
The *AnyMedia* Access System and/or the ONU are fed by a power supply (which covers -48V DC power and ringing generator) delivered with the *AnyMedia* Access System or with the ONU.

LOF
Loss Of Frame - A LOF condition is declared when an out-of-frame (OOF) condition persists for t seconds.

LOF on ADSL line
ADSL frame synchronization has been lost at the ADSL for at least 2.5 seconds.

Loop timed
The *AnyMedia* Access System is synchronized by the clock derived from the E1 feeder.

LOS
Loss Of Signal - The E1 LOS condition is declared if N consecutive no pulses are received. The station clock (SC) LOS condition is declared if N consecutive no pulses are received.

LOS on ADSL line
Received power has dropped to 6 dB below the reference power. The timing threshold is as follows:

- Downstream: 1.5 seconds
- Upstream: 2.5 seconds.

LPU112
An ISDN application pack with 12 line circuits per pack. It supports 12 U interfaces with 2B1Q line coding and remote power feeding.

LPU430
An ISDN application pack with 16 line circuits per pack. It supports 16 U interfaces with 4B3T line coding and remote power feeding.

LT
Line Termination - The equipment that terminates the access transmission system on the network side.

LTU
The line termination unit (LTU) is located at the network side of an HDSL link and acts as the master.

M

Mass provisioning
A time-efficient way of provisioning a system with a large number of configuration parameters with the help of a dedicated tool.

MIB
Management information base - Declaration of a collection of objects that defines the network or network element for a given interface protocol. For example, there is a MIB defined for access using the simple network management protocol (SNMP) and a different MIB defined for access using the protocol of the GR-303 Embedded Operations Channel (EOC).

Mixed ISDN/POTS mode
An operation mode of the *AnyMedia* Access System where ISDN and POTS service is possible. Because ISDN subscribers are provisioned, the frame relay function has to be performed. Therefore at least one IO_HDLC pack is necessary (optionally a second one for protection). V5 communication channel information is frame relayed on the IO_HDLC pack and routed towards ISDN subscribers (for ISDN D-channel information) and to the COMDAC (for V5 layer 3 protocols) respectively.

Mixed service
The capability to split the 2-Mbit/s payload of the HDSL interface at the NTU to a G.703 for ISDN PRA service and to a leased line port (V.35/V.36/X.21) for n $\times$ 64 kbit/s digital leased line service. The used timeslots of the G.703 port are routed to the V5.2 interface, while the 64 kbit/s timeslots used for n $\times$ 64 kbit/s digital leased line service are routed to 2 Mbit/s-leased line links.

Monitoring
The operator can hear the subscriber while the circuit is still operational and in a bridged state. Additionally a speech connection can be established to allow the operator to talk to the customer.

MTBF
Mean Time Between Failures - The average time that the system remains operational between consecutive failures. The MTBF is usually expressed in years. In general, MTBF = MTTF + MTTR where MTTF is the mean time to failure, and MTTR is the mean time to repair.

MTIE
Maximum Time Interval Error - The maximum peak-to-peak delay variation of a given timing signal with respect to an ideal timing signal within a particular time period.

MTTF
Mean Time To Failure -The average time that the system remains operational between consecutive failures, excluding outage duration for repair or maintenance activities. The MTTF is usually expressed in years.

MTTR
Mean Time To Repair - The average time that the system remains out of service until it is repaired. The MTTR is usually expressed in hours.

Multi-link
A collection of more than one 2.048-Mbit/s link which together make up a V5.2 interface (although a V5.2 interface need not have more than one 2.048-Mbit/s link).

N

Near end
The termination of an external interface at the access network element (ANE) site.

Non-service-affecting
Refers to a condition not affecting the service (e.g. telephony) at the time it is detected.

Normal polarity
The customer-specific definition of the feeding polarity. Some customers define normal polarity as the a-wire is more negative with respect to the b-wire. Other customers define normal polarity as the b-wire is more negative with respect to the a-wire.

NT
Network Termination - The equipment that terminates the access transmission system on the customer side. The best known network termination device is the NT1, that provides only physical layer functionality. Other network termination devices with more functionality are NT-N or NT-a/b.

NTU
The network termination unit (NTU) is located at the customer side of an HDSL link and acts as the slave. The NTU terminates the HDSL access transmission system on the customer side.

NVDS
Nonvolatile Data Storage - NVDS refers to that part of the database which can be retained even after a power failure, e.g. provision parameters.

NVPS
Nonvolatile Program Storage - NVPS refers to nonvolatile memory on the COMDAC used to store the load image.

O

Off-hook
In the off-hook state the telephone receiver is picked up. The off-hook state indicates the busy state.

On-demand tests
On-demand tests will be executed only by an operator TL1 command.

On-hook
In the on-hook state the telephone is not picked up. The on-hook state indicates the idle state.

OAP
Optical Application Pack within the *AnyMedia* Mainshelf to provide the interface for the optical link to an ONU.

OCP
Optical Controller Pack for ONU located in a dedicated slot of the ONU Subshelf to provide the interface for the optical link to the *AnyMedia* Mainshelf.

ONU Subshelf
Optical Network Unit Subshelf - The ONU Subshelf is a co-located or remotely installed shelf connected to the *AnyMedia* Mainshelf via a subshelf link. It extends the capabilities of the *AnyMedia* Mainshelf by means of additional subscriber interfaces.

OOF
Out Of Frame - The OOF condition is assumed when three consecutive incorrect frame alignment signals have been received.

Optical link
See subshelf link.

Originating call
An originating call is the type of call initiated at the subscriber side of the network user interface. It comprises the build-up, speech and the tear-down phase. For a POTS call, for instance it starts with the recognition of an off-hook state by the application pack (AP) and the sending of a seizure message to the LE.

Out-band signaling
For transferring signaling information, bandwidth beside the voice transmission band (300 ... 3400 Hz) of the same transmission path is used.

P

Pack
Term that is generally used for circuit pack units (e.g. LPZ100, IO_E1) which have pre-designated slots with the capability to plug in the circuit pack.

Pack Type
Different pack types can be plugged in the AP slots of the *AnyMedia* Access System:

- POTS AP (LPZ100, LPZ120, LPP100)
- ISDN AP (LPU112 for 2B1Q U interface, LPU430 for 4B3T U interface)
- HDSL AP (LPS501)
- ADSL AP (LPA400)
- OAP (LPF500)
- AFM_E3 (LPA910), AFMDS3 (LPA900)
- TEST AP (TAP 100)

Payload
The interface rate minus frame overhead. This is the net capability for information transfer provided for the next lowest level of the digital signal hierarchy.

PID
Program Identification Code - Identifies the version of firmware on one or more devices on the pack.

PLL
Permanent Leased Line - These lines may be analog (ALL) or digital (DLL). They are not switched services and are not carried to the LE through the V5 interface but on special separate 2-Mbit/s links.

Plug-in
The same as Pack.

Port
Refers to the devices and functions built on or provided by a pack for one subscriber or line interface; sometimes referenced as circuit.

POTS
Plain Old Telephone Service - Analog telephony service via a copper pair.

POTS AP
Plain Old Telephone Service Application Pack - A pack containing Z ports that provide service to analog subscriber interfaces.

POTS-only mode
An operation mode of the *AnyMedia* Access System where only POTS service is possible. Since no ISDN subscribers are provided, no frame relay function has to be performed. Therefore, no IO_HDLC is necessary. V5 communication channels via TSI are connected directly to the COMDAC where they are terminated.

POTS subscriber
Plain Old Telephone Service subscriber - Analog telephony subscriber.

PPM
Periodic Pulse Metering - The LE provides the transmission of charging information to the subscriber's home meter equipment. Charging information will be carried as periodic pulses via the subscriber's line.

Pre-provisioning
The ability of provisioning the complete system without the existence of the complete system hardware. Only the basic equipment is required.

Provisioning
The process of providing the system with parameters needed to realize a specific customer-specific and site-specific behavior.

Provisioning variant
The provisioning variant is a unique label of a complete provisioning data set applied via the TL1 interface. These provisioning data sets must be provisioned and if necessary changed (on the ANE side by TL1 commands) consistently on both sides (LE and ANE). These changes have no impact on the provisioning variant. Switching over from one provisioning variant to another (and thus changing the provisioning data set) is done by using the common control protocol.

PSTN (user port)
Public Switched Telephone Network - Delivers analog telephony and data services to a POTS subscriber. It is addressed by a logical layer 3 address used in the relevant protocols on the V5.x interface. With respect to the V5.x interface the layer 3 address uniquely identifies one PSTN user port.

R

RAI
Remote Alarm Indication - Indicates an alarm at the far end of the E1 interface.

Remote mass provisioning
Mass provisioning performed from a remote GSI/EM connected to the *AnyMedia* Access System via ROCs. Before an *AnyMedia* Access System can be mass-provisioned from a remote node, some minimal configuration is needed, in order to allocate the resources needed by the ROCs. This has to be done locally using a GSI either manually or using the initial mass provisioning procedure.

Remote power feeding
Refers to the power feeding of the NT/Regenerator by the ISDN AP. Normal powering and restricted powering mode are distinguished. In the restricted powering mode the polarity of the feeding voltage at the S/T interface is reversed.
Normal powering mode:
In the normal powering mode, the NT (and an optional regenerator) receive power from the ISDN AP. The power for all subscriber terminals on the subscriber side of the S/T interface is supplied by a mains-operated power supply unit at the CPE.
Restricted powering mode:
The restricted powering mode occurs, when the main power at the CPE fails. In this case the ISDN AP must provide power for the NT (and an optional regenerator) and also to a single designated restricted mode terminal on the subscriber side of the S/T interface.

Reverse polarity
Defined as the opposite of the normal polarity, that means the feeding polarity is reversed.

RMC
Remote Maintenance Channel - A remote connection located at the OCP for craft personnel with similar functionality as the CIT interface of the CIU.

ROC
Remote Operations Channel - A bearer channel over a 2.048-Mbit/s leased-line link that conveys management information for a remote system (*AnyMedia* Access System). The ROC is expected to be used when the system is installed at locations where no separate network (e.g. LAN Ethernet) exists.

Router
A network layer device that forwards packets from one network to another based on network layer information (OSI layer 3). The term "bridge/router" is used for a bridging router that combines the functionality of a multiprotocol router with the functionality of a bridge.

RTU
Remote Test Unit - An RTU is a testing equipment for subscriber lines. An RTU-2 is collocated to the system and performs test functions (application of test signals and measurements) under the control of a test system controller. An RTU-1 is collocated to the central office and not used in the 30 channel market.

S

SC
Station Clock - An external 2048 kHz synchronization signal, according to ITU-T G.703.

Semi-permanent leased line
A V5.x service where bearer channels for certain user ports are pre-connected on a provisioning basis. Semi-permanent leased lines pass through the V5.x interface and are established under the control of the LE by using the BCC protocol after recovery of the V5.2 interface (V5.1 bearer connections are established anyway). No on-demand signaling is possible.
Semi-permanent leased lines are supported for both, POTS and ISDN subscribers.

Serial number
The serial number is a 12-character code uniquely identifying each pack and indicating the date and place of manufacture.

Server pack
The pack in an AP slot of the *AnyMedia* Mainshelf which provides server ports necessary for connecting the AnyMedia Mainshelf and the ONU Subshelf.
The Optical Application Pack (OAP) is also called server pack.

Service-affecting
Refers to a condition affecting the service (e.g. telephony) at the time it is detected.

Service state
Each unit in the system at any time has a defined service state. This service state is system driven and shows the usability of the unit. The normal service state is a read-only value and cannot be changed by the operator. Each service state consists of two parts: a primary service state displaying the general usability [in service (IS) or out of service (OOS)] and a secondary service state displaying the failure reason if appropriate [e.g. not operational (NOP)]. The secondary service state is not used in all cases. Additionally there is an administrative service state, whose primary service state is changeable via TL1 commands. The operator can set the desired mode for operation: IS or OOS. In this case the current availability is expressed in the secondary state which is controlled and changed automatically by the system.

Shelf daisy-chain
Connecting AnyMedia shelves to daisy-chain AFMs together for ADSL services only.
This can be done locally by connecting the AFM ports directly or remotely via SDH transport network.

Side switch
The operation of deactivating the active COMDAC and activating the stand-by COMDAC.

Simplex mode
One COMDAC is equipped in the *AnyMedia* Access System and controls the whole system. If this COMDAC fails the system also fails.

Site-specific
Reflects the particular configuration of the site. Site-specific configuration is achieved by provisioning.

SNMP
Simple Network Management Protocol - Used by the GSI/AEM for the *AnyMedia* Access System broadband product for accessing the MIB objects.

Software package
At the architectural level, software packages are the primary vehicle for functional partitioning of the system. Software packages are configuration units of the system.

Software factory
The software factory is responsible for the pre-configuration and pre-installation of the system software. The software factory also creates installation files (e.g. CD, diskettes etc.) for delivery to the customer.

Status condition
Report of a type of standing condition that reflects abnormal conditions or other anomalies that are not assigned a severity. Status conditions are necessary to indicate to the EM or the operator that the system is in an unusual state, or is performing an action that may interfere with system operations, such as loop-back, software installation, or a forced or inhibited protection switch. A status condition is reported via a report-event TL1 message and can be retrieved via a TL1 command.

Subscriber line
The a/b copper pair between a local exchange (LE) or access network system (AN) and the network connection point (NCP) (see ITU G.101).

Subscriber loop
Contains the subscriber's line, subscriber's installation and subscriber's terminal; sometimes referenced as drop.

Subscriber loop feeding
Subscriber loop feeding will be provided for POTS to supply the subscriber's terminal with power and for supervisioning the subscriber's loop.

Subshelf
See ONU Subshelf.

Subshelf link
Proprietary optical link with a transport rate of 155 Mbit/s.

SW
Software - Software is program data which is downloadable into the system.

T

TAP
Test Access Path - Two metallic test access paths, one consisting of two pairs (TAP-B) and the other of six pairs (TAP-A), provide both internal and external metallic test access to the ports and drops of the application packs. This access is provided via the CIU/OCP and the GPB.

TAP100
Test Application Pack - TAP100 is the internal test head executing the measurements required for the drop.

TELNET
A remote terminal interface protocol which allows remote login capability into a system on a network from any other node on that network that is also running TELNET. TELNET is a TCP/IP application.

Terminating call
A terminating call is the type of call initiated on the network side of the network user interface. It comprises the build-up, speech and the tear-down phase. For a POTS call, for instance it starts with a message from the LE to the *AnyMedia* Access System to seize a given subscriber and to supply ringing current.

Test Access Path (TAP)
See TAP.

Test session
A test session is the procedure including all necessary functions to test a subscriber. This includes the setup of the test path as well as the release of the test equipment. The test session runs in the *AnyMedia* Access System.

Timeslot number
A timeslot number identifies a timeslot of 64 kbit/s within the 2048-kbit/s V5.x link. The range is 1 to 31. The timeslot may be used as a bearer channel, communication channel or protection physical channel. Timeslot 0 is reserved and not used for the purposes described above.

TL1
Transaction Language 1 - A Bellcore standard message language. It is the primary means of operating and maintaining the *AnyMedia* Access System. A TL1 message session supports bi-directional message transmission, and when a TL1 link is established the system can initiate autonomous messages to monitor alarms and changes in system status.This is the message protocol used on the AEM and CIT interfaces.

TL1 defaults
Transaction Language 1 defaults - TL1 defaults are the parameter values built into the *AnyMedia* Access System when it is shipped from the factory. One TL1 default parameter, for instance, stands for no given TL1 parameters.

T/R cable
The same as a/b-cable.

TRAP
An autonomous report in the Simple Network Management Protocol (SNMP), sent out by a network element towards an SNMP network manager, indicating an exceptional event.

TS
Timeslot - Any cyclic time interval that can be recognized and defined uniquely. E.g., a 64-kbit/s channel of a V5 interface that can be used either as a bearer channel (carrying subscriber payload information) or as a communication channel (carrying both subscriber and network element signaling information).

TSI
Timeslot Interchanger - This is a switch able to route any timeslot on the subscriber side to any timeslot on the feeder side and vice versa. There is a limited loopback capacity for cross-connections on either subscriber or feeder side.

Turn-up
The process of bringing the system or a system component to an operational state (it includes hardware and software installation as well as self diagnostics). After that the system can be provisioned for service and other operational functionality.

U

U interface
A 2-wire digital subscriber interface. It is used for connection of NT equipments and carries digital signals. In addition the U interface must provide the DC feeding of NTs.

U port
Refers to the devices and functions built on or provided by an ISDN AP to support ISDN-BRA or DLL service. Note that more than one U port is housed on an *AnyMedia* Access System ISDN-U AP, e.g. the LPU112 provides 12 U ports.

Upload
A binary data transfer from the *AnyMedia* Access System to the GSI.

Upstream
The bit stream direction from the NT towards the network.

Upstream direction
Transmission direction from customer to ATM network or telephony switch.

V

V5.x interface
An ETSI defined interface between a local exchange and an access network element. A V5.1 interface consists of one single 2-Mbit/s (E1) link containing communication channels and bearer channels. A V5.2 interface consists of up to sixteen 2-Mbit/s (E1) links containing communication channels and bearer channels. The term V5.x interface is used for clarification that certain facts, a certain description or requirements are relevant for both V5.1 and V5.2 interface.

VF cable
The same as a/b-cable.

Voltage dips
Voltage dips are short voltage reductions or fluctuations.

Voltage gaps
Voltage gaps are short voltage interruptions.

W

WaveStar ADM 4/1
A compact and cost-effective SDH multiplexer. The WaveStar ADM 4/1 (former product designation ADM 155 C) can be used in different configurations such as terminal multiplexer, add/drop multiplexer and repeater, and can be used in the dual terminal mode. It has a wide range of tributary interfaces. The WaveStar ADM 4/1 multiplexes 2-Mbit/s, 34-Mbit/s, 45-Mbit/s, and STM-1 signals into an STM-1 or STM-4 line signal. Cross-connects can be made at VC-12 level.

Z

Z interface
A 2-wire analog subscriber interface. It is used for connection of analog subscriber lines and carries signals such as speech, voice-band analog data and multi-frequency push-button signals, etc. In addition, the Z interface must provide the DC feeding of the subscriber's terminal and ordinary functions such as DC signaling, ringing, metering, etc., where appropriate (see ITU-T Q.551 2.1.1).

Z port
A Z port is circuitry built on a POTS AP to provide a Z interface for analog subscribers. Note that more than one Z port is housed on an *AnyMedia* Access System POTS AP, e.g. the LPZ100 provides 32 Z ports.

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